

# Hunters Point Naval Shipyard, Parcel G, RSY Data Report

Contract No. N62473-17-D-006 CTO N6247318F5065 RSY Pad Data Report								
RSY Pad: RSY 35 Use 2				Soil Origin: TU-107B ESU				
Data attached and submitted by: Amy Mangel				Data Report Submittal Date: 01/29/2021				

Systematic Soil Sample Data: RSY 35 Use 2								
Sample Identification	Sample Location	Type of Sample	Gamma Static 3x3 Nal Reading (CPM)	Gamma 3x3 Static Investigation Level (CPM)	<sup>226</sup> Ra Final Analytical Results (pCi/g)	<sup>137</sup> Cs Final Analytical Results (pCi/g)	<sup>90</sup> Sr Final Analytical Results (pCi/g)	<sup>232</sup> Th Final Analytical Results (pCi/g)
<b>Project Remediation Goals*</b>								
HPPG-ESU-TU107B-001	1	Systematic	10,361	15,359	0.400	0.00122	0.270	0.357
HPPG-ESU-TU107B-002	2	Systematic	9,976	15,359	0.333	0.0710	N/A	N/A
HPPG-ESU-TU107B-003	3	Systematic	10,465	15,359	0.366	0.000	N/A	N/A
HPPG-ESU-TU107B-004	4	Systematic	10,430	15,359	0.432	-0.0209	N/A	N/A
HPPG-ESU-TU107B-005	5	Systematic	10,203	15,359	0.342	0.0304	N/A	N/A
HPPG-ESU-TU107B-006	6	Systematic	10,125	15,359	0.382	-0.0180	N/A	N/A
HPPG-ESU-TU107B-007	7	Systematic	10,420	15,359	0.103	-0.0188	N/A	N/A
HPPG-ESU-TU107B-008	8	Systematic	9,916	15,359	0.394	-0.0490	N/A	N/A
HPPG-ESU-TU107B-009	9	Systematic	10,060	15,359	0.303	-0.0194	N/A	N/A
HPPG-ESU-TU107B-010	10	Systematic	9,931	15,359	0.281	-0.0457	N/A	N/A
HPPG-ESU-TU107B-011	11	Systematic	10,417	15,359	0.473	0.0256	0.0186	0.318
HPPG-ESU-TU107B-012	12	Systematic	10,145	15,359	0.351	-0.0226	N/A	N/A
HPPG-ESU-TU107B-013	13	Systematic	9,957	15,359	0.287	-0.0304	N/A	N/A
HPPG-ESU-TU107B-014	14	Systematic	9,938	15,359	0.353	0.0182	N/A	N/A
HPPG-ESU-TU107B-015	15	Systematic	10,014	15,359	0.172	-0.0351	N/A	N/A
HPPG-ESU-TU107B-016	16	Systematic	9,825	15,359	0.302	-0.00359	N/A	N/A
HPPG-ESU-TU107B-017	17	Systematic	10,057	15,359	0.411	-0.0214	N/A	N/A
HPPG-ESU-TU107B-018	18	Systematic	9,574	15,359	0.362	0.0176	N/A	N/A
HPPG-ESU-TU107B-019	19	Systematic	10,445	15,359	0.358	0.0403	N/A	N/A
HPPG-ESU-TU107B-020	20	Systematic	9,639	15,359	0.341	-0.0132	N/A	N/A
HPPG-ESU-TU107B-021	21	Systematic	10,622	15,359	0.211	0.0103	0.0433	1.25
HPPG-ESU-TU107B-022	22	Systematic	9,997	15,359	0.0537	0.00948	N/A	N/A
HPPG-ESU-TU107B-023	23	Systematic	10,005	15,359	0.293	0.0125	N/A	N/A
HPPG-ESU-TU107B-024	24	Systematic	9,926	15,359	0.307	0.0187	N/A	N/A
HPPG-ESU-TU107B-025	25	Systematic	9,821	15,359	0.355	-0.0149	N/A	N/A
<b>Soil Systematic Sample Statistics</b>					<sup>226</sup> Ra Final Analytical Results (pCi/g)	<sup>137</sup> Cs Final Analytical Results (pCi/g)	<sup>90</sup> Sr Final Analytical Results (pCi/g)	<sup>232</sup> Th Final Analytical Results (pCi/g)
					Maximum	0.473	0.071	0.270
					Mean	0.3186	-0.0023	0.1106
					Median	0.342	-0.0036	0.0433
					Minimum	0.0537	-0.049	0.0186
					Standard Deviation	0.0969	0.0281	N/A

Biased Soil Sample Data: RSY 35 Use 2								
Sample Identification	Sample Location	Type of Sample	Gamma Static 3x3 Nal Reading (CPM)	Gamma 3x3 Static Investigation Level (CPM)	<sup>226</sup> Ra Final Analytical Results (pCi/g)	<sup>137</sup> Cs Final Analytical Results (pCi/g)	<sup>90</sup> Sr Final Analytical Results (pCi/g)	<sup>232</sup> Th Final Analytical Results (pCi/g)
<b>Project Remediation Goals*</b>								
HPPG-ESU-TU107B-B-001	1	Biased	10,008	15,658	0.329	-0.0251	-0.0106	0.325

CPM Counts per minute

pCi/g Picocuries per gram

\* Note: Project Remediation goal (RG) is the Record of Decision RG or Offsite RBA value, whichever is higher

Instrument and Survey Summary					
Activity	Survey #	Date	Meter	Calibration Due Date	Serial #
Gamma Walkover Survey	HPRS-11232020-PG-ROV-334	11/23/2020	RS-700	03/31/2022	5447/5448
Follow-Up Static Survey	HPRS-11242020-PG-JSS-343	11/24/2020	RS-700	03/31/2022	5447/5448
Systematic Sample Survey	HPRS-11242020-PG-JSS-345	11/24/2020	3x3	10/09/2021	271420
Biased Sample Survey	HPRS-11252020-PG-JSS-348	11/25/2020	3x3	08/06/2021	106853

Region of Interest (ROI) Summary	
ROI	Nuclide and Energy
ROI 3	Ra-226 (1764 keV)
ROI 4	Th-232 (2614 keV)
ROI 6	Ra-226 (609 keV)
ROI 7	Cs-137 (662 keV)
ROI 8	Ra-226 (351 keV)
ROI 10	Gross Gamma

Summary: RSY 35 Use 2
1) Gamma walkover survey and data review—upon review of initial RS-700 scan data in accordance with Final Parcel G Work Plan Section 3.5.1.1, 8 follow-up static investigations were required. Gamma scan data summary statistics, normal Q-Q plots, histograms, and box plots are provided on pages 3-6. Contour maps of the scan data for the ROIs of interest are presented on page 7. The RSY scan data was lower than the background scan data. The exact same RS-700 and detectors were used for the background data collection and the RSY pad data collection. Note: this RSY pad was only partially full, which is why there is a low number of scan data points.
2) One-minute static follow-up measurements with the RS-700 were collected at 8 gamma walkover investigation locations in accordance with Final Parcel G Work Plan Section 3.3.1. A map of the follow-up locations is presented on page 9. The net follow-up static spectra are presented on pages 14-21. The exact same RS-700 and detectors were used for the background data collection and the RSY pad data collection.
3) In accordance with Final Parcel G Work Plan Section 3.4.1, twenty-five systematic soil samples (001-025) were obtained and submitted for gamma spectroscopy analysis. Sample locations are shown on the Systematic Sample Survey map (page 10). TestAmerica sample results are attached (pages 22-55). Ten percent of the systematic soil samples (three samples in total -001, -011, & -021) were also analyzed for <sup>90</sup> Sr and <sup>232</sup> Th (via alpha spectroscopy). Strontium-90 and <sup>232</sup> Th results are also included in the TestAmerica sample results reports (pages 22-55). Samples HPPG-F-049 and HPPG-F-050 are field duplicates, correlating to systematic samples -004 and -016. The Data Quality Assessment which will be included in the RACR will provide an analysis and discussion of field duplicates for the project. The Instrument and Survey Summary table above lists the 3x3 NaI detector used for the gamma static measurements collected during sampling activities, and the instrument-specific gamma static IL listed in the sample tables on page one is developed from that instrument's RBA data.
Systematic sample histograms, box plots, Q-Q plots, and power curves are provided on pages 12-13. All sample results were below the applicable RGs. The number of samples collected was sufficient to meet project DQOs.
4) In accordance with Final Parcel G Work Plan Section 3.3.1 and 3.4.1, one biased sample was collected since all follow-up static measurements were below the ROC-specific critical levels. The biased sample was collected from the location of the highest gross gamma scan measurement. TestAmerica sample results are attached (pages 56-72). A map of the biased sample location is presented on page 11. Biased sample results were all below the applicable RGs.
<b>Conclusions:</b>  In accordance with the DQOs in Section 3.1 of the Final Parcel G Work Plan, final analytical results for all samples from the RSY pad were shown by a point by point comparison to meet the RGs. Graphical comparisons demonstrated that ROC concentrations were consistent with background.  RSY 35 Use 2 contains soil from Hunters Point Naval Shipyard Parcel G Phase 1 excavation TU-107B ESU.  APTIM requests RASO concurrence to release this soil as Non-LLRW. Disposition: This soil shall be used as backfill for TU-107.

## Soil Scan Statistics

### Statistical Summary

Dataset	PG-RSY-35-U2				
	ROI	Minimum (cps)	Maximum (cps)	Mean (cps)	Median (cps)
ROI-03	4.01	25.06	13.20	13.03	3.59
ROI-04	3.01	24.05	13.51	13.03	3.64
ROI-06	65.13	126.26	91.00	91.18	10.05
ROI-07	45.10	98.21	70.70	71.14	8.72
ROI-08	77.17	160.33	113.56	113.27	11.08
ROI-10	2,024.29	2,471.99	2,245.02	2,249.27	71.57

### Statistical Summary Reference Background

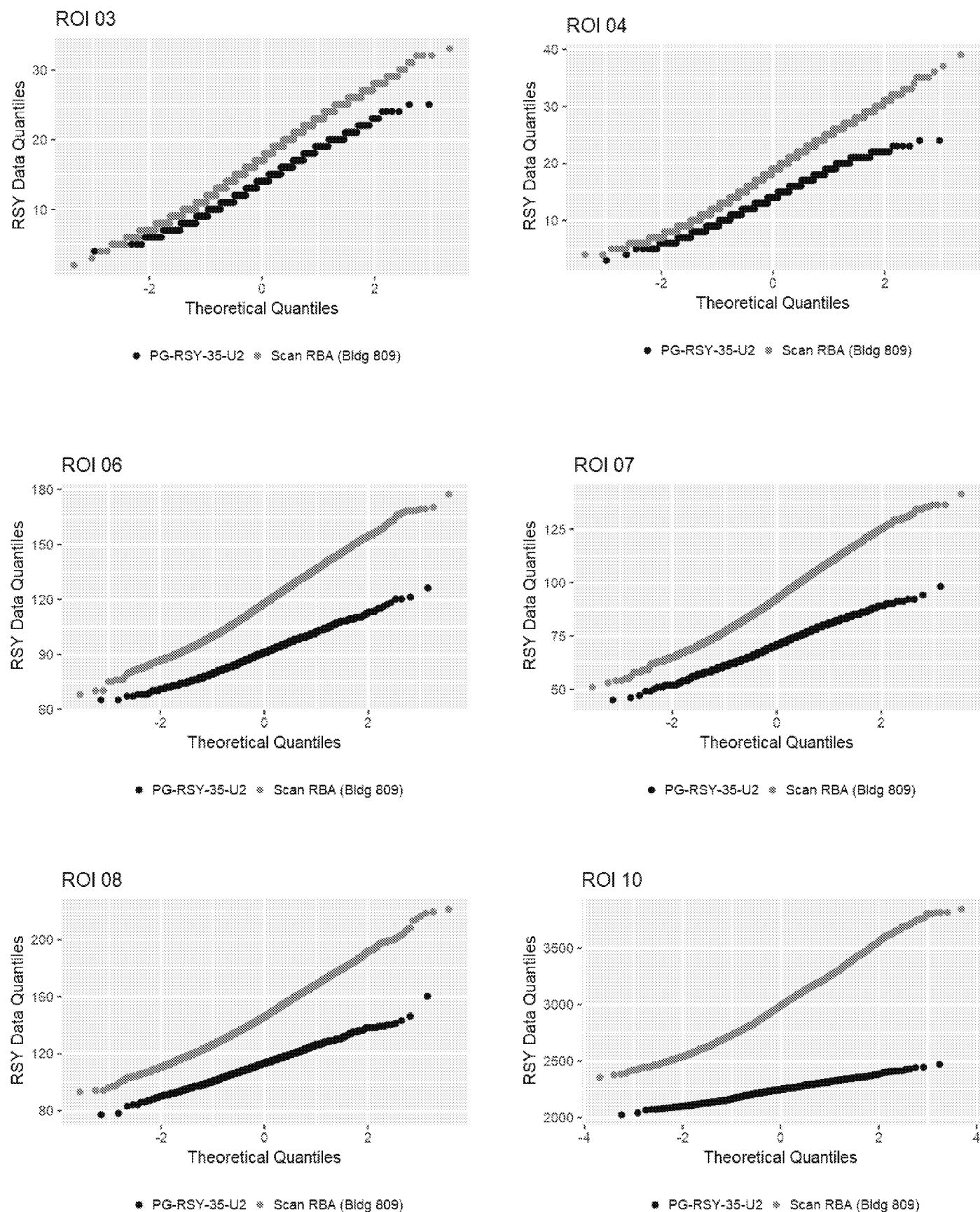
TYPE	Scan RBA (Bldg 809)				
	ROI	Minimum (cps)	Maximum (cps)	Mean (cps)	Median (cps)
ROI-03	2.00	33.08	16.21	16.04	4.13
ROI-04	4.01	39.08	17.52	17.04	4.89
ROI-06	68.15	177.45	117.58	117.26	15.50
ROI-07	51.11	141.33	92.34	91.24	13.43
ROI-08	93.19	221.48	146.24	145.30	18.21
ROI-10	2,354.11	3,845.31	2,995.57	2,989.64	255.66

cps = counts per second

Dataset	Number of Data Points
PG-RSY-35-U2	869
Scan RBA (Bldg 809)	4632

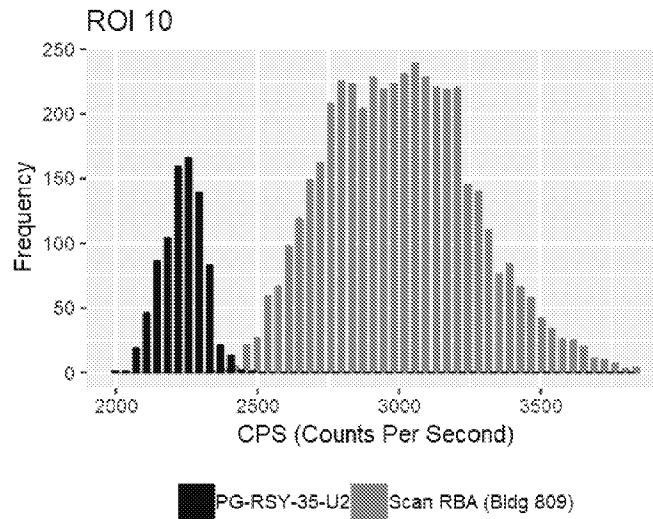
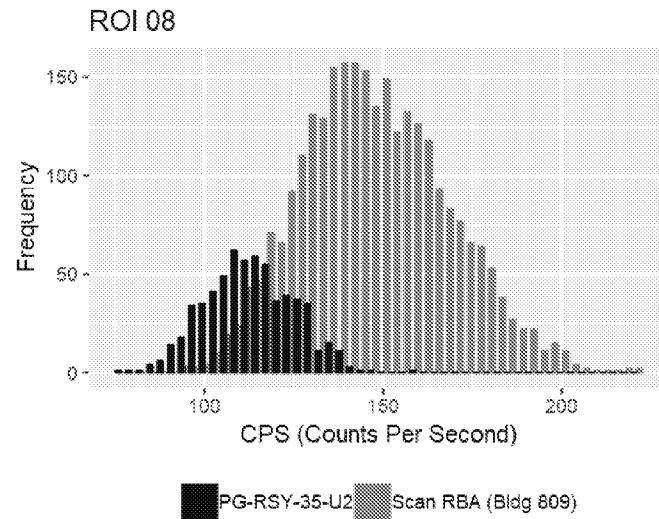
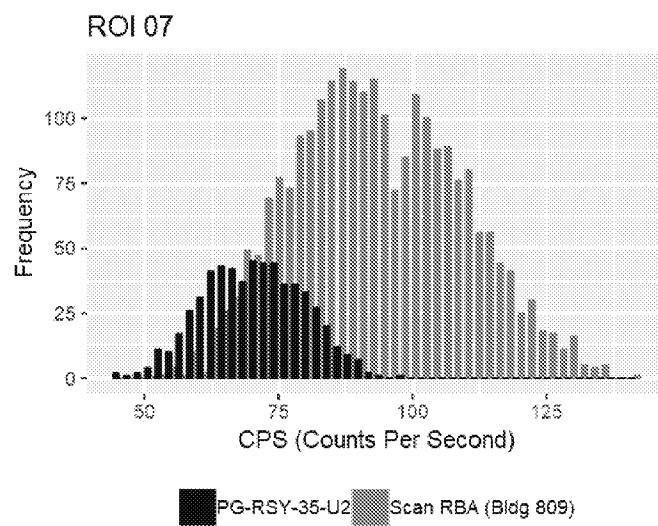
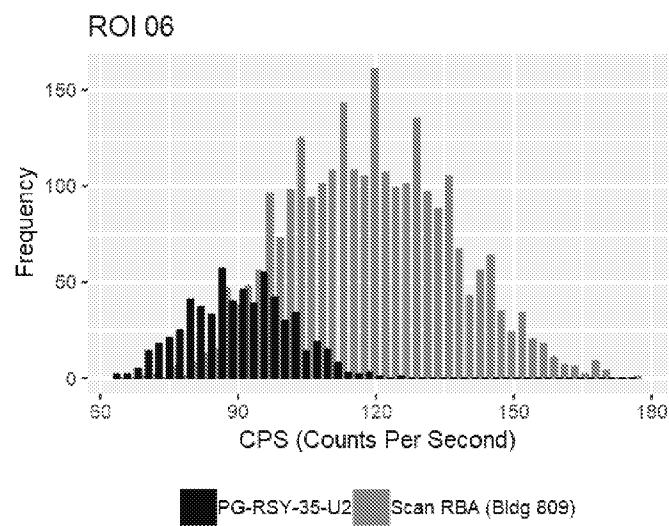
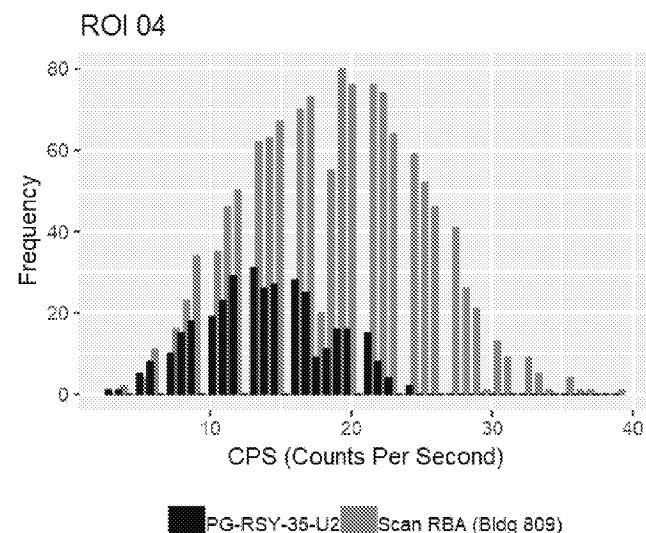
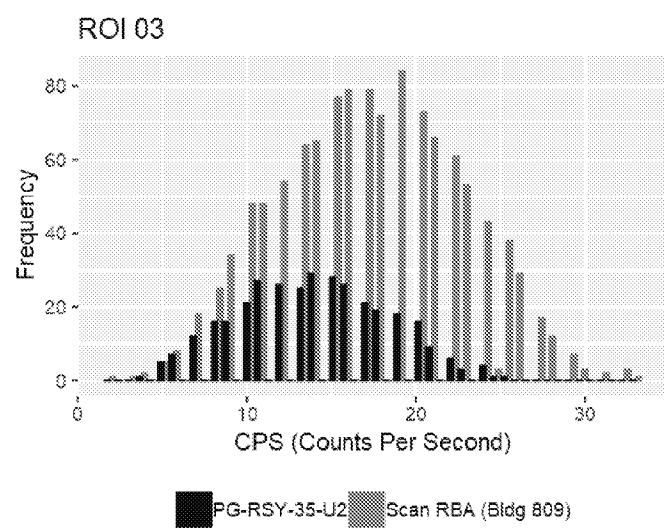
# Soil Scan Statistics

## Normal Q-Q Plots



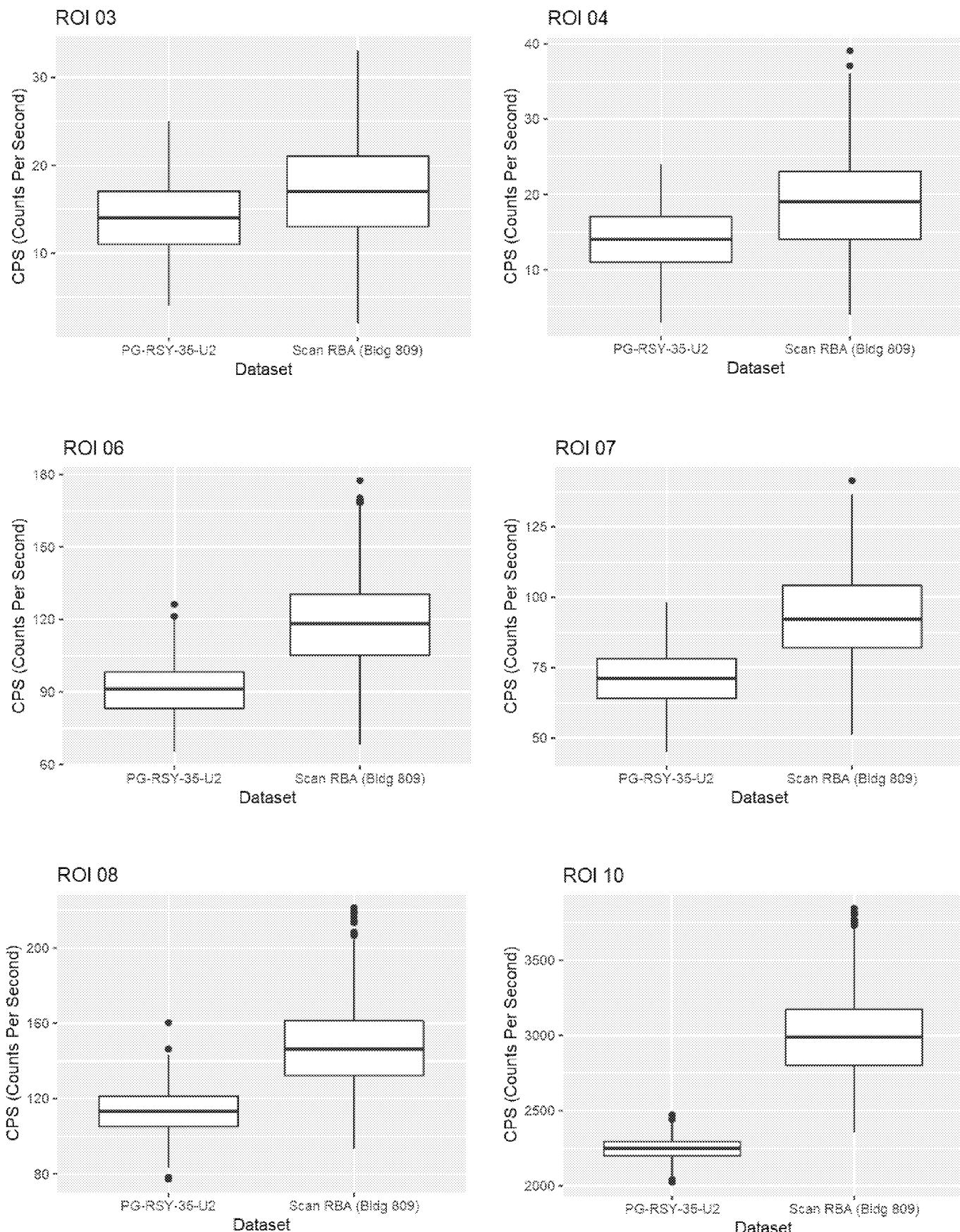
# Soil Scan Statistics

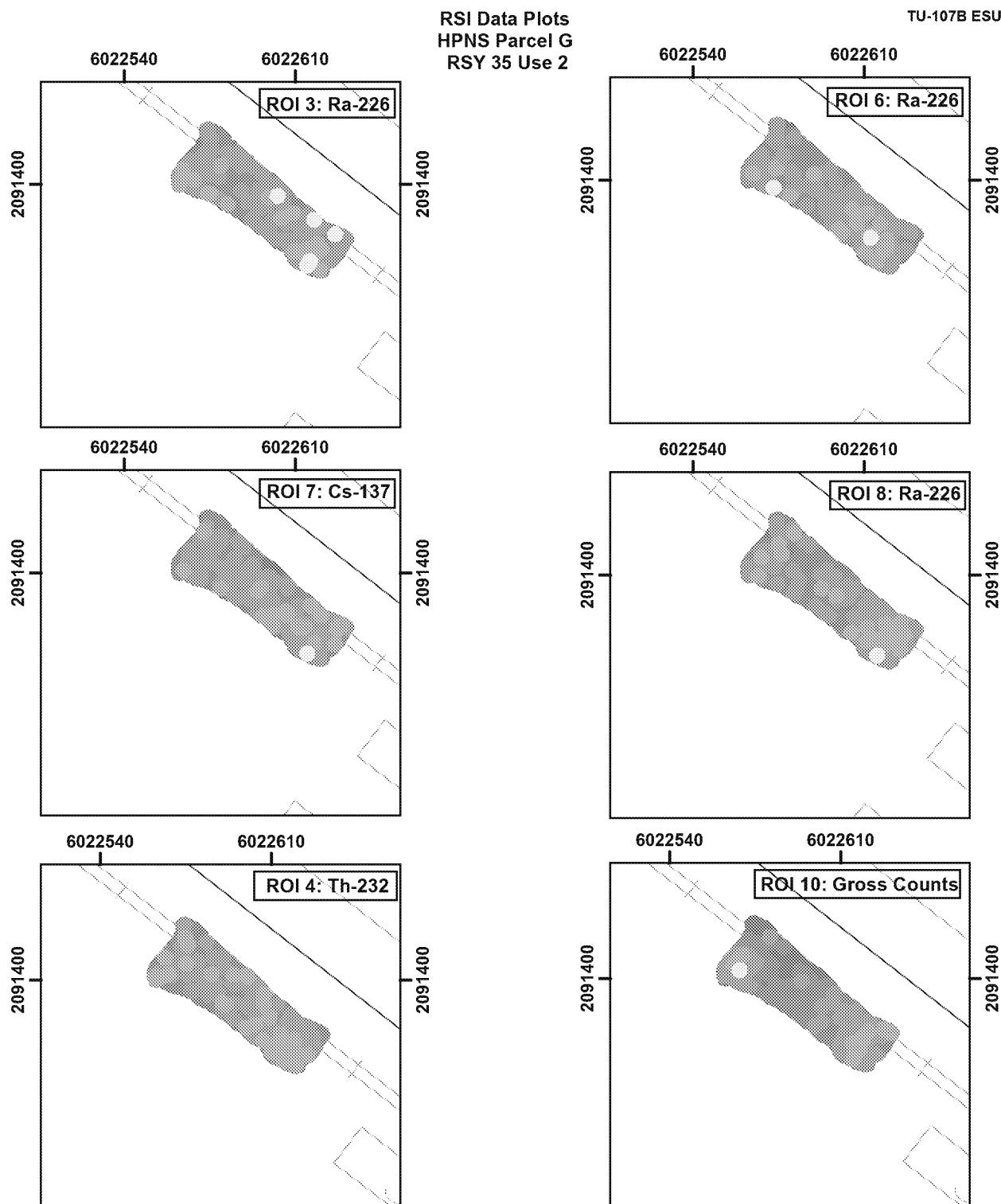
## Histograms



# Soil Scan Statistics

## Box Plots



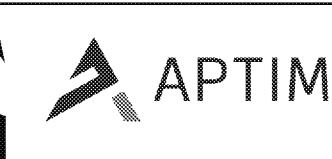


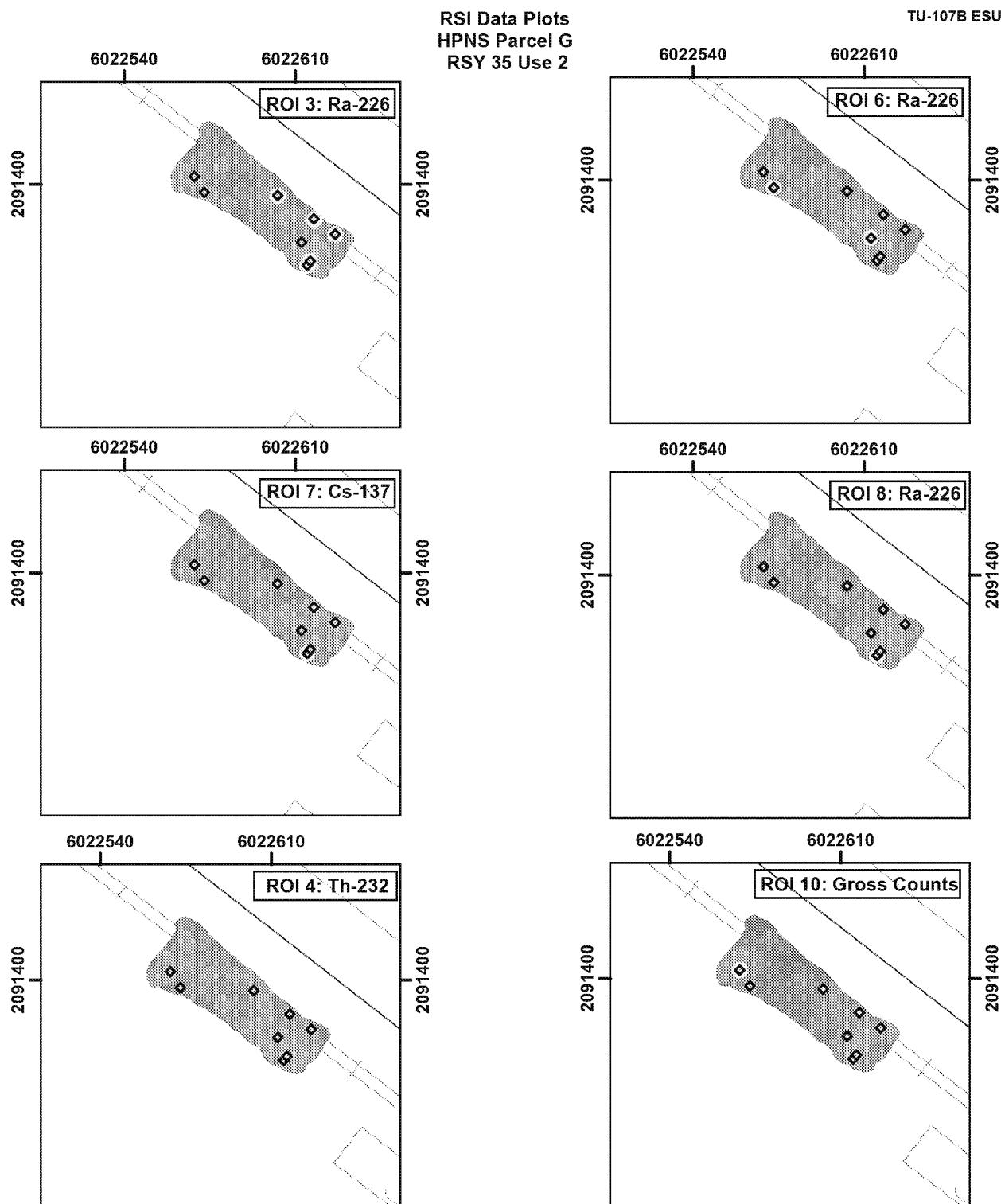
#### RS 700 Gamma Walkover Survey Data (VD1)

> 3 std dev	> -1 to < 0 std dev
●	●
> 2 to < 3 std dev	> -2 to < -1 std dev
●	●
> 1 to < 2 std dev	> -3 to < -2 std dev
●	●
> 0 to < 1 std dev	< -3 std dev
●	●

0 25 50 100 Feet

Coordinate system: CSP Zone III, NAD83, US Survey Foot




**RS 700 Gamma Walkover Survey Data (VD1)**

- |                       |                        |
|-----------------------|------------------------|
| ◆ Follow-Up Locations | ● > -1 to < 0 std dev  |
| > 3 std dev           | ● > -2 to < -1 std dev |
| ● > 2 to < 3 std dev  | ● > -3 to < -2 std dev |
| ● > 1 to < 2 std dev  | ● < -3 std dev         |
| ● > 0 to < 1 std dev  |                        |

0 25 50 100 Feet

Coordinate system: CSP Zone III, NAD83, US Survey Foot



RSI Data Plots  
HPNS Parcel G  
RSY 35 Use 2

TU-107B ESU



RSY 35 Use 2 (VD1, ROI 10 Gross Gamma)

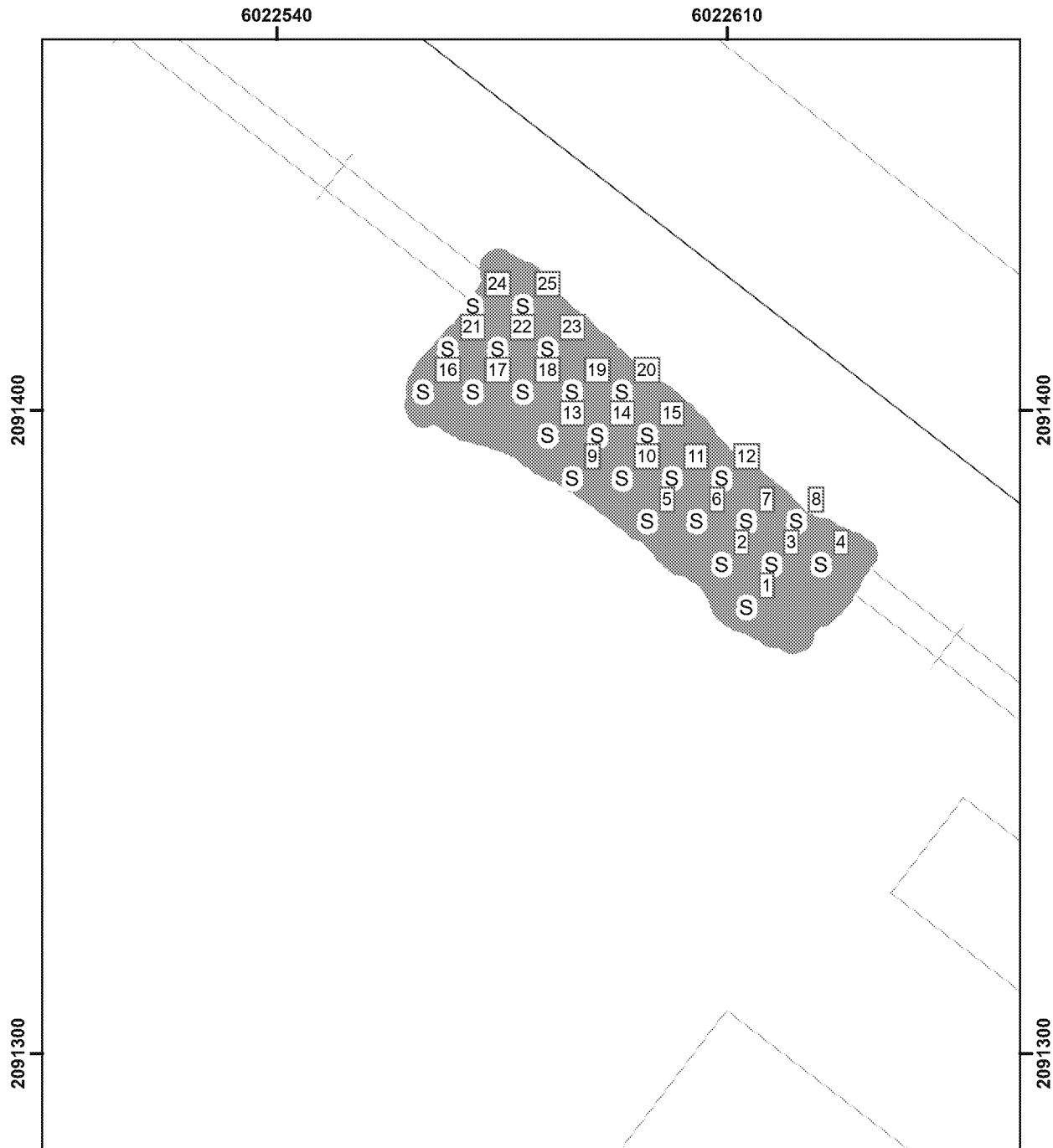
- ◆ Follow-Up Locations
- > 1 to < 2 std dev
- > -2 to < -1 std dev
- > 3 std dev
- > 0 to < 1 std dev
- > -3 to < -2 std dev
- > 2 to < 3 std dev
- > -1 to < 0 std dev
- < -3 std dev

20 10 0 20 Feet  
Coordinate system: CSP Zone III, NAD83, US Survey Foot



Systematic Sampling  
HPNS Parcel G  
RSY 35 Use 2

TU-107B ESU



**RSY 35 Use 2**

S Systematic Sample Locations

● RS-700 GWS Coverage

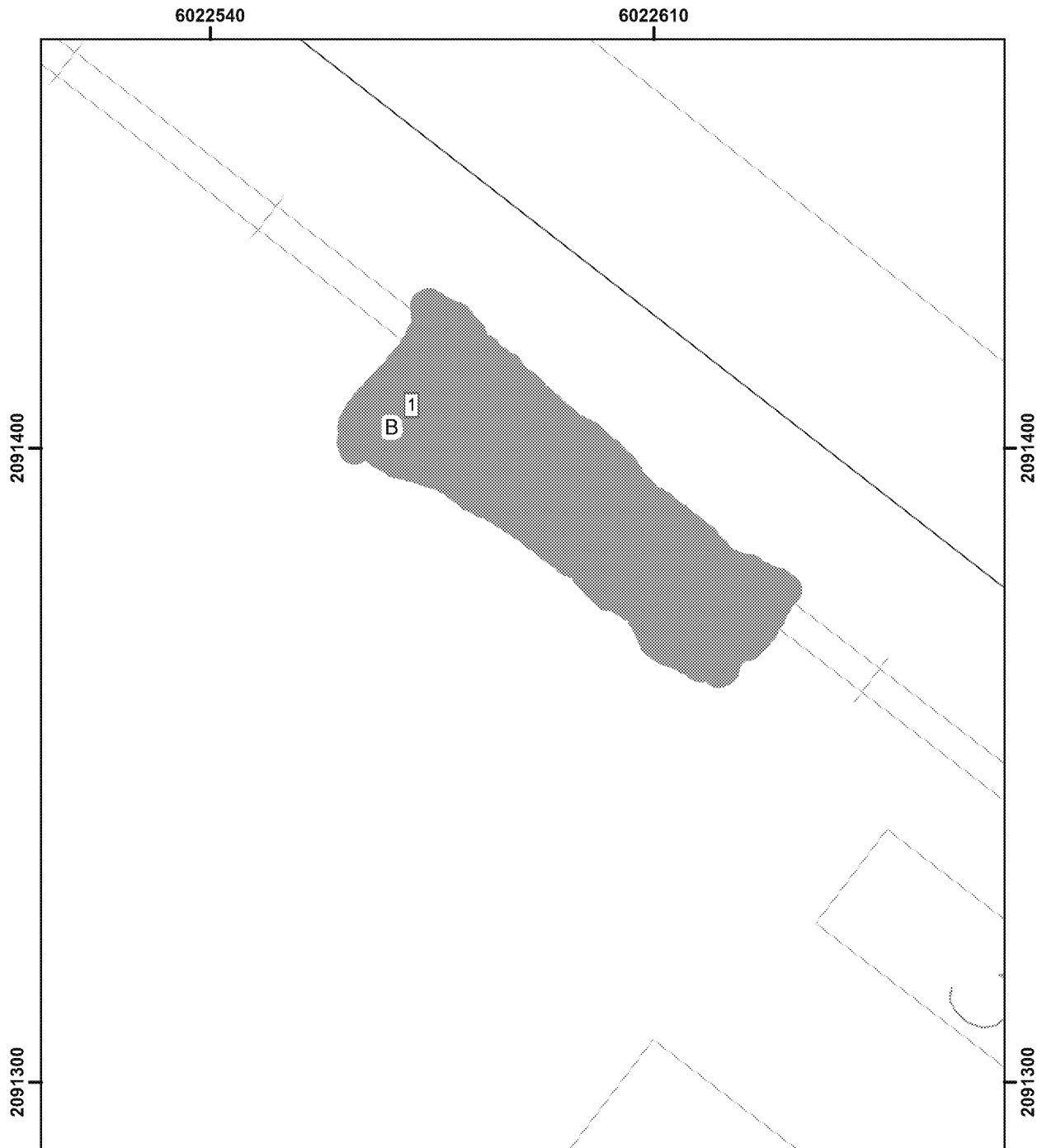
0 10 20 40 Feet

Coordinate system: CSP Zone III, NAD83, US Survey Foot



Biased Sampling  
HPNS Parcel G  
RSY 35 Use 2

TU-107B ESU



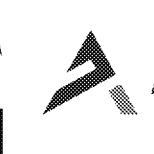
**RSY 35 Use 2**

B Biased Sample Location

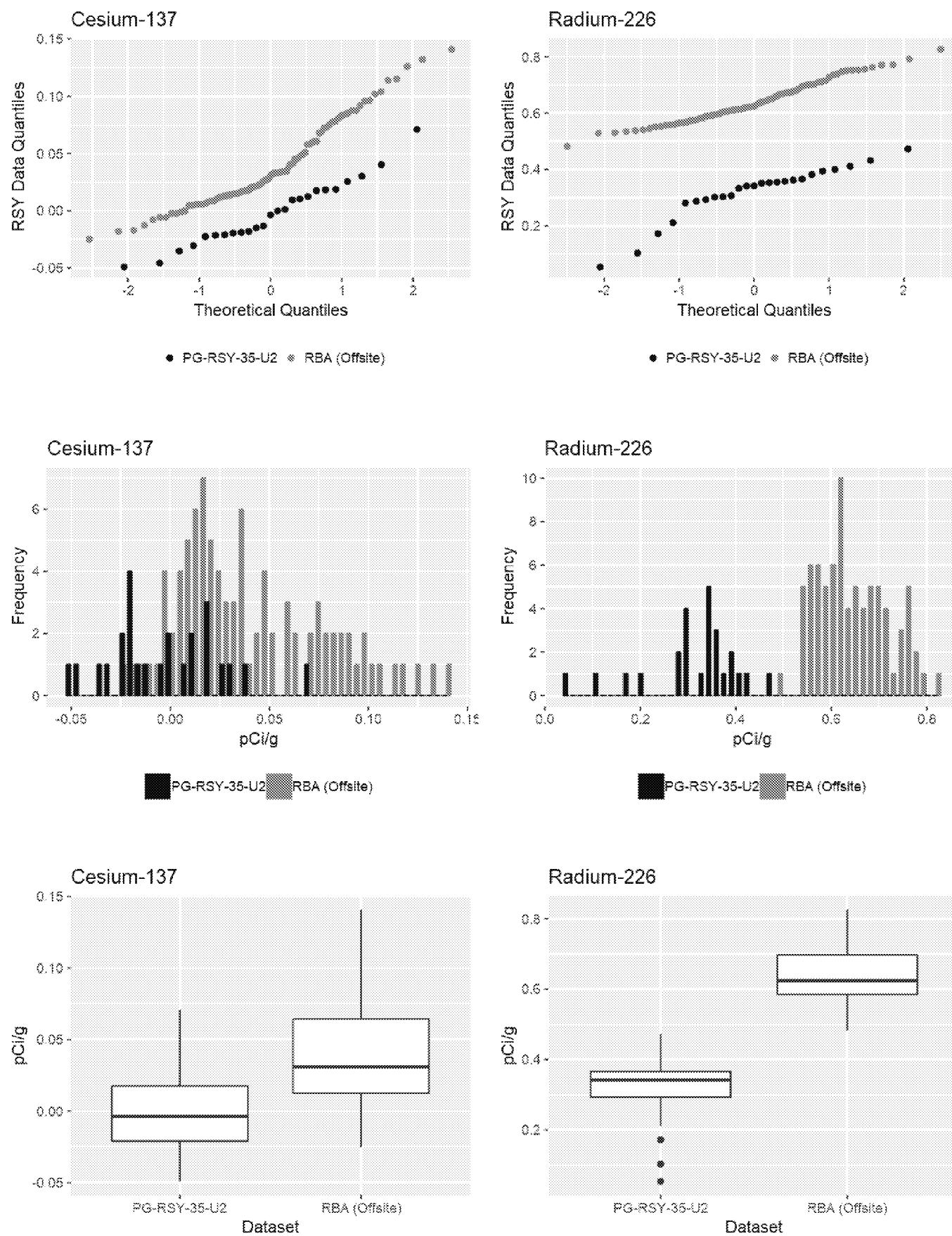
● RS-700 GWS Coverage

20 10 0 20 Feet

Coordinate system: CSP Zone III, NAD83, US Survey Foot



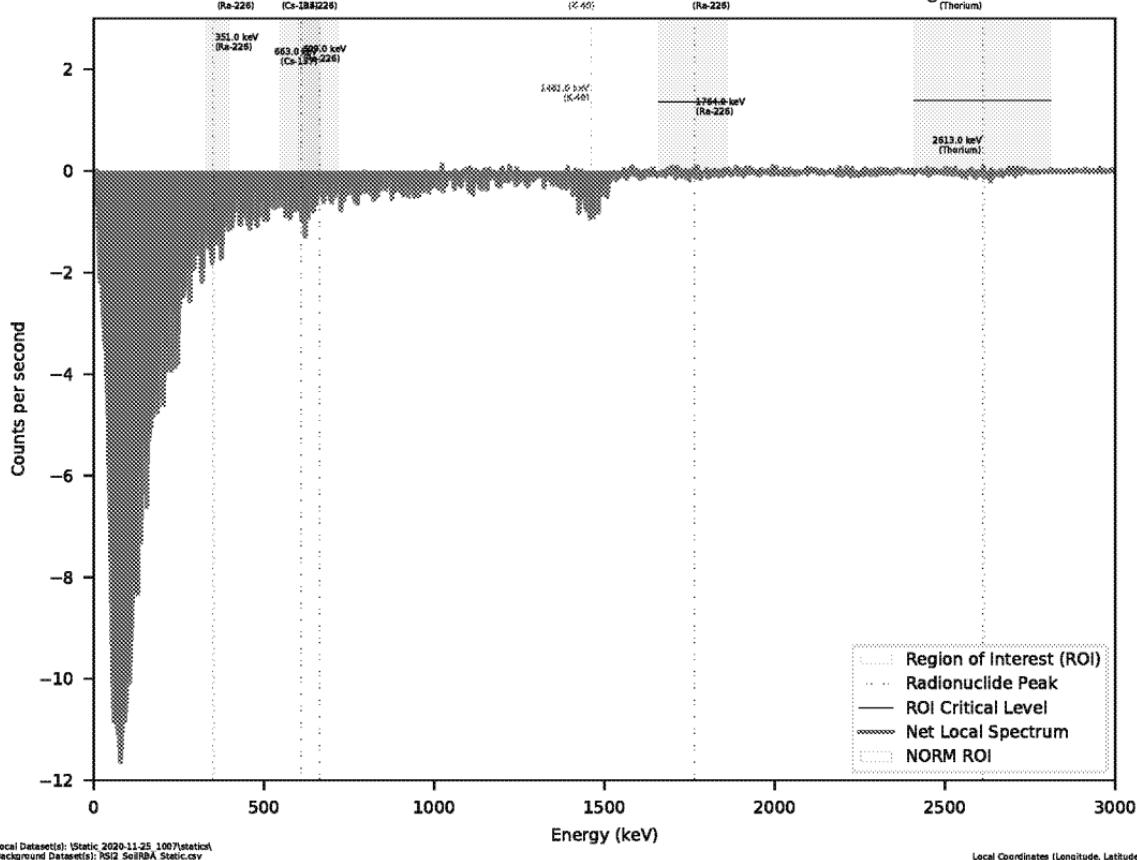
## Soil Sample Statistics





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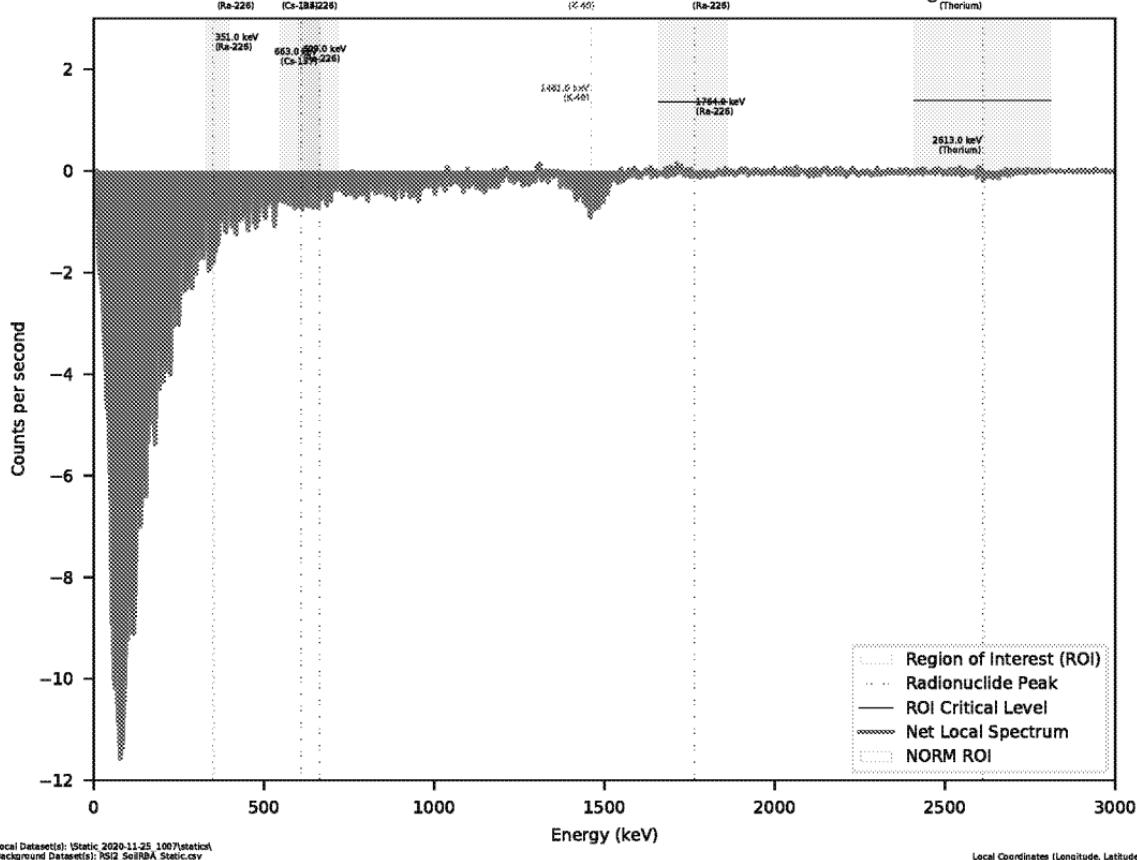
Page 14 of 72



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## Net Gamma Spectrum, Static Location: 2

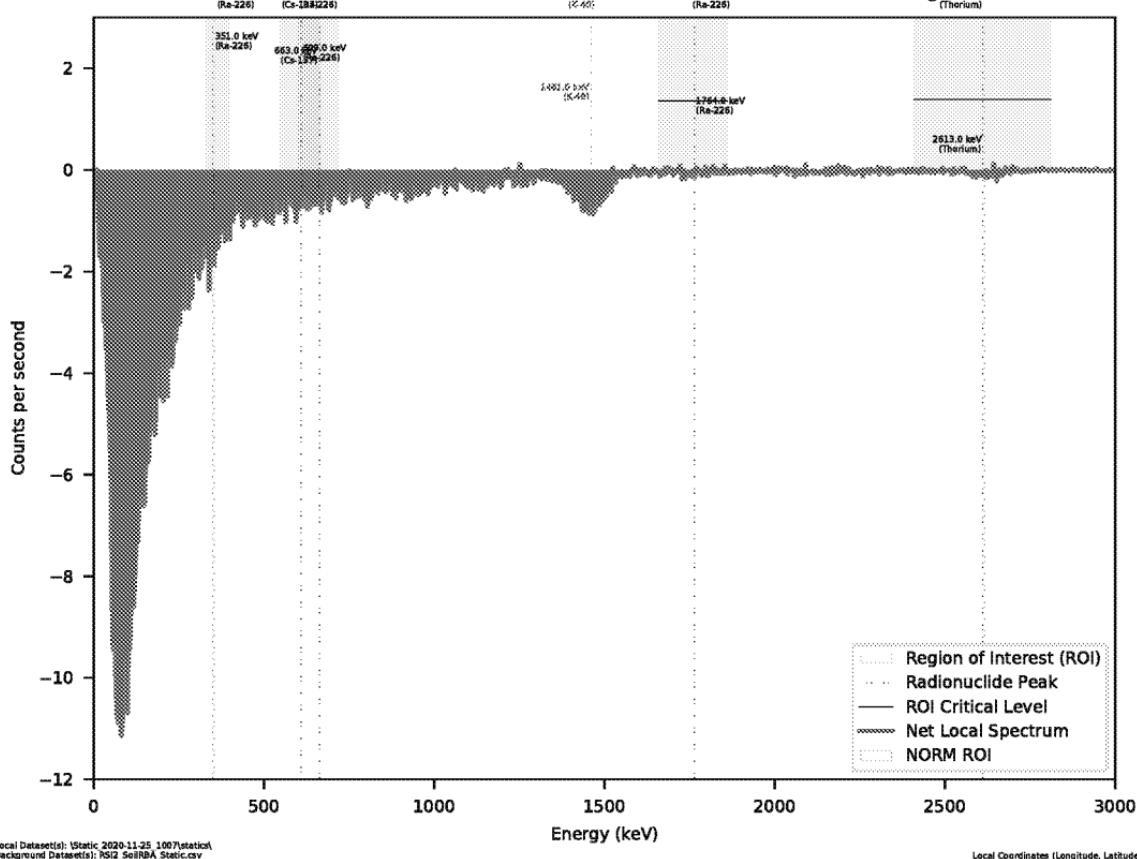
Page 15 of 72



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## Net Gamma Spectrum, Static Location: 3

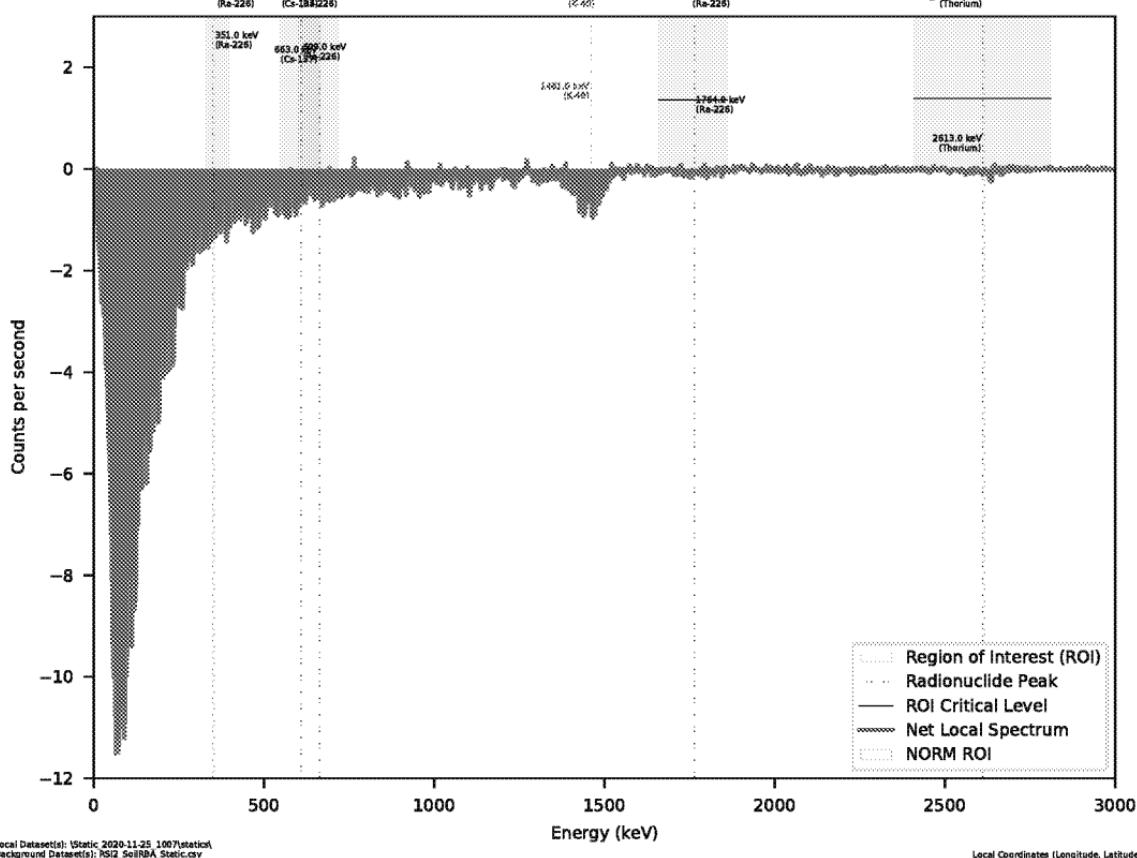
Page 16 of 72



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## Net Gamma Spectrum, Static Location: 4

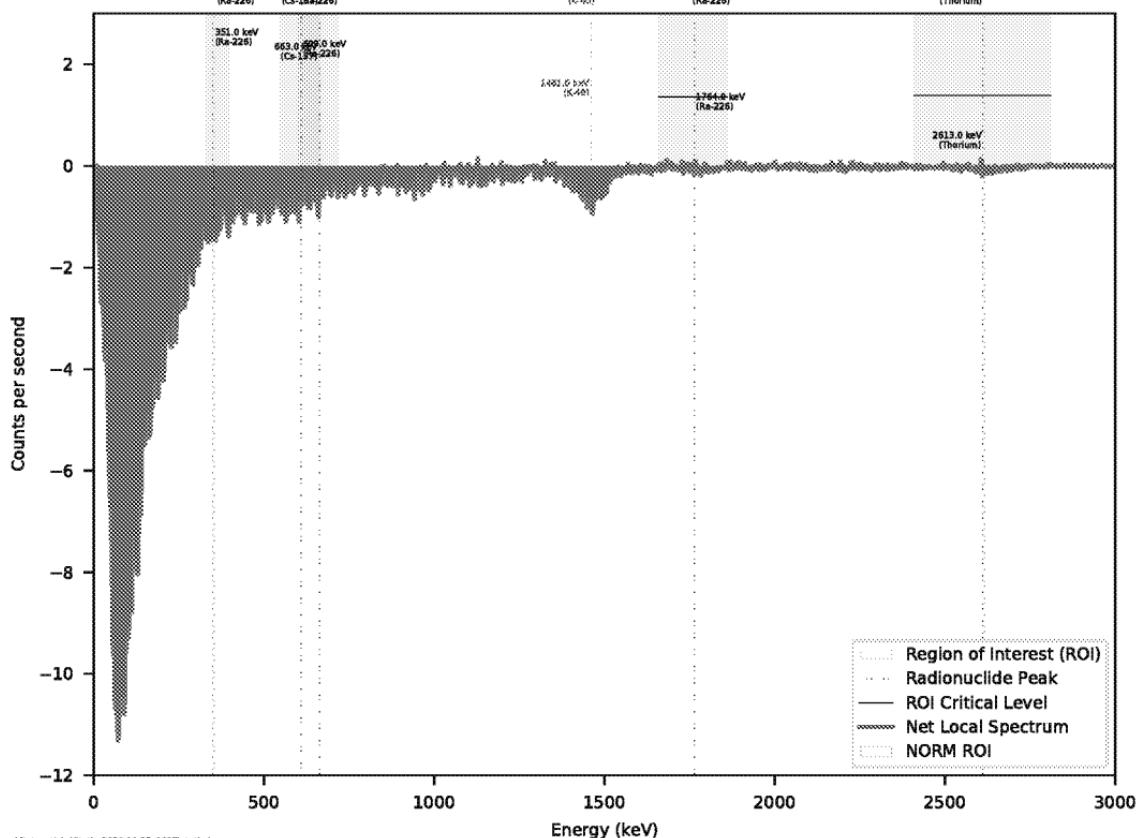
Page 17 of 72



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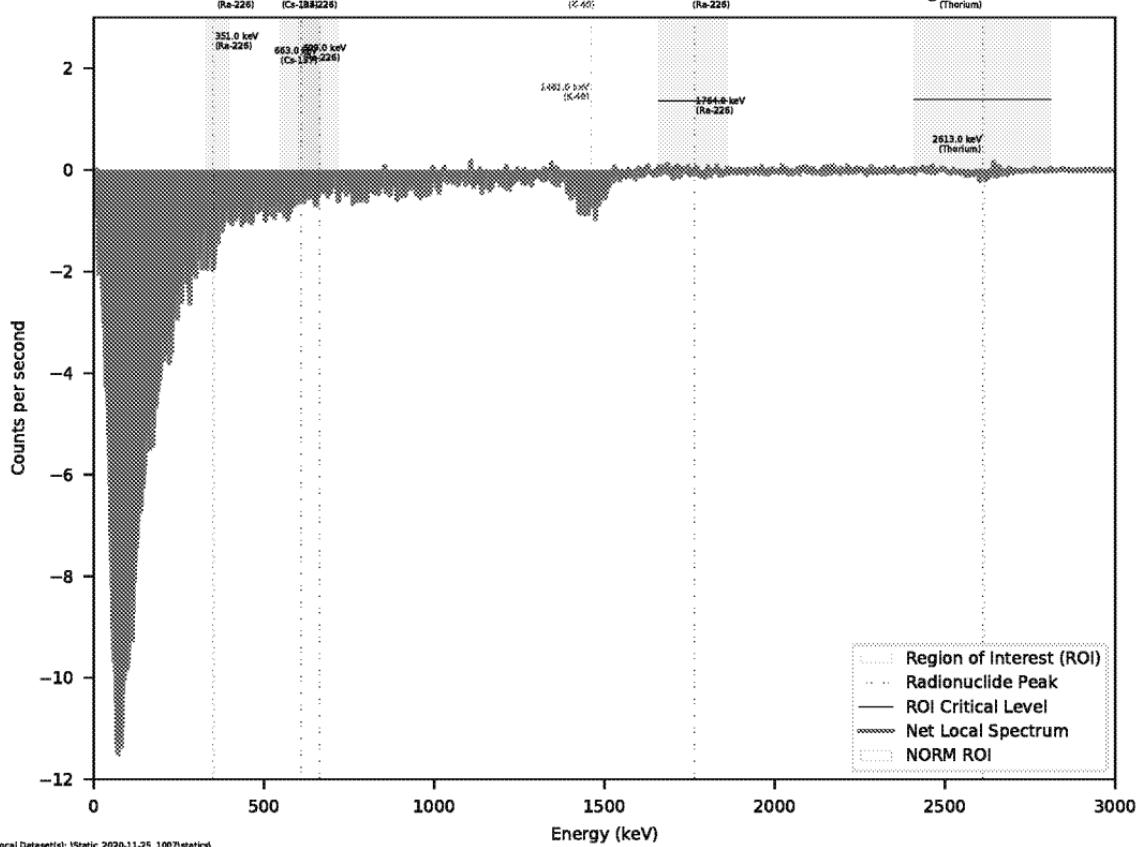
## Net Gamma Spectrum, Static Location: 5

Page 18 of 72



## Net Gamma Spectrum, Static Location: 6

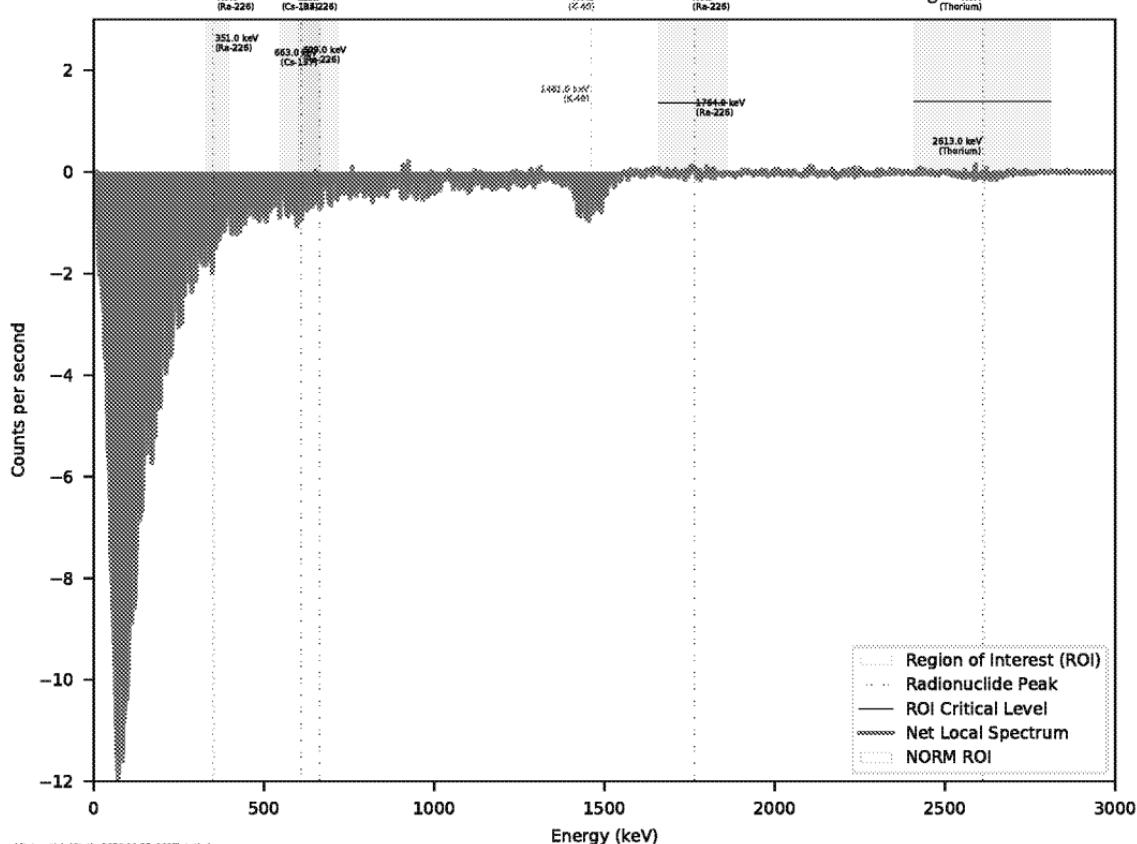
Page 19 of 72



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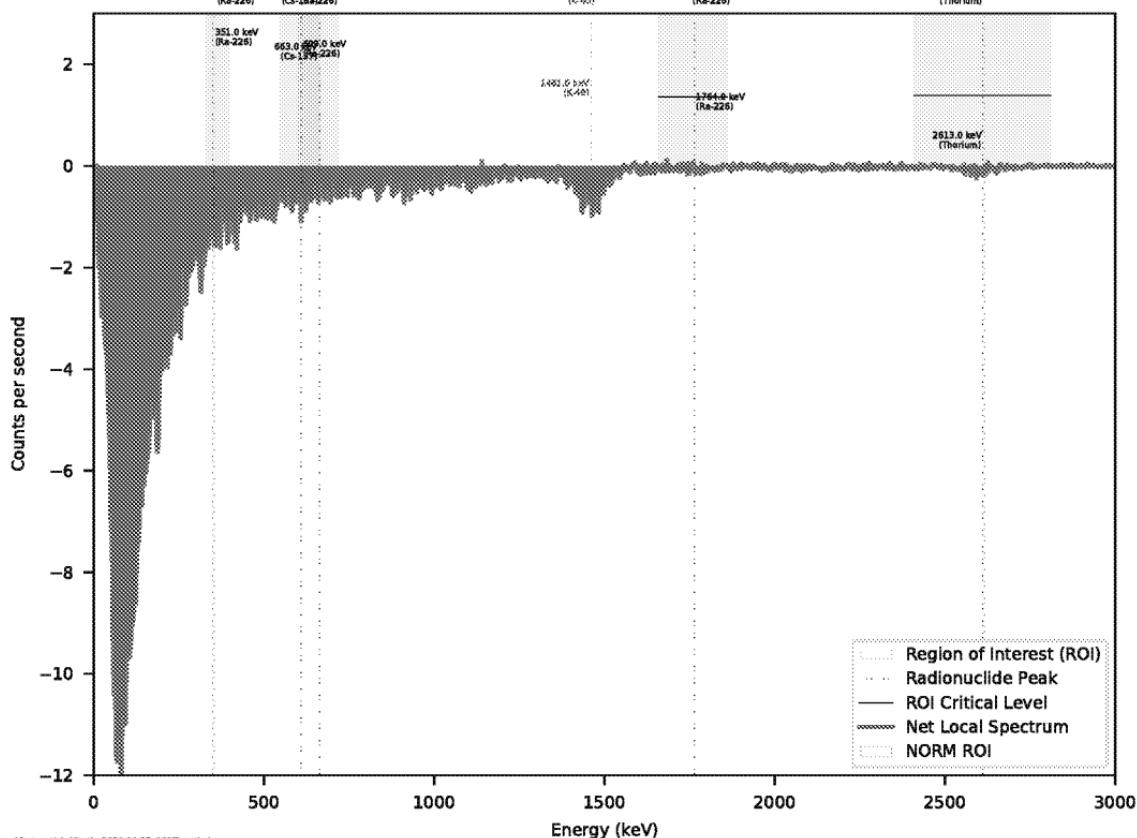
## Net Gamma Spectrum, Static Location: 7

Page 20 of 72



## Net Gamma Spectrum, Static Location: 8

Page 21 of 72





## Environment Testing America

### ANALYTICAL REPORT

Eurofins TestAmerica, St. Louis  
13715 Rider Trail North  
Earth City, MO 63045  
Tel: (314)298-8566

Laboratory Job ID: 160-40596-1  
Laboratory Sample Delivery Group: GJ46599740  
Client Project/Site: HPNS-Parcel G 501197  
Revision: 2

For:  
Aptim Federal Services LLC  
4005 Port Chicago Hwy, Suite 200  
Concord, California 94520

Attn: Rose Condit

*Rhonda Ridenhower*

---

Authorized for release by:  
4/14/2021 2:52:01 PM

Rhonda Ridenhower, Client Service Manager  
(314)298-8566  
Rhonda.Ridenhower@Eurofinset.com

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*This report has been electronically signed and authorized by the signatory. Electronic signature is intended to be the legally binding equivalent of a traditionally handwritten signature.*

*Results relate only to the items tested and the sample(s) as received by the laboratory.*

# Table of Contents

Cover Page . . . . .	1
Table of Contents . . . . .	2
Case Narrative . . . . .	3
Chain of Custody . . . . .	6
Receipt Checklists . . . . .	10
Definitions/Glossary . . . . .	11
Method Summary . . . . .	12
Sample Summary . . . . .	13
Client Sample Results . . . . .	14
QC Sample Results . . . . .	29
QC Association Summary . . . . .	32
Tracer Carrier Summary . . . . .	34

# Case Narrative

Client: Aptim Federal Services LLC  
Project/Site: HPNS-Parcel G 501197

Page 24 of 72

Job ID: 160-40596-1  
SDG: GJ46599740

**Job ID: 160-40596-1**

**Laboratory: Eurofins TestAmerica, St. Louis**

**Narrative**

## CASE NARRATIVE

**Client: Aptim Federal Services LLC**

**Project: HPNS-Parcel G 501197**

**Report Number: 160-40596-1**

With the exceptions noted as flags or footnotes, standard analytical protocols were followed in the analysis of the samples and no problems were encountered or anomalies observed. In addition all laboratory quality control samples were within established control limits, with any exceptions noted below. Each sample was analyzed to achieve the lowest possible reporting limit within the constraints of the method. In some cases, due to interference or analytes present at high concentrations, samples were diluted. For diluted samples, the reporting limits are adjusted relative to the dilution required.

Eurofins TestAmerica, St. Louis attests to the validity of the laboratory data generated by Eurofins TestAmerica facilities reported herein. All analyses performed by Eurofins TestAmerica facilities were done using established laboratory SOPs that incorporate QA/QC procedures described in the application methods. Eurofins TestAmerica's operations groups have reviewed the data for compliance with the laboratory QA/QC plan, and data have been found to be compliant with laboratory protocols unless otherwise noted below.

The test results in this report meet all NELAP requirements for parameters for which accreditation is required or available. Any exceptions to NELAP requirements are noted in this report. Pursuant to NELAP, this report may not be reproduced, except in full, without the written approval of the laboratory.

Calculations are performed before rounding to avoid round-off errors in calculated results.

All holding times were met and proper preservation noted for the methods performed on these samples, unless otherwise detailed in the individual sections below.

All solid sample results for Chemistry analyses are reported on an ""as received"" basis unless otherwise indicated by the presence of a % solids value in the method header. All soil/sediment sample results for radiochemistry analyses are based upon sample as dried and disaggregated with the exception of tritium, carbon-14, and iodine-129 by gamma spectroscopy unless requested as wet weight by the client."

Any minimum detectable concentration (MDC), critical value (DLC), or Safe Drinking Water Act detection limit (SDWA DL) is sample-specific unless otherwise stated elsewhere in this narrative.

Reference the chain of custody and condition upon receipt report for any variations on receipt conditions and temperature of samples on receipt.

Manual Integrations were performed only when necessary and are in compliance with the laboratory's standard operating procedure. Detailed information can be found in the raw data section of the level IV report.

Radiochemistry sample results are reported with the count date/time applied as the Activity Reference Date.

The matrix for the Method Blank and LCS is as close to the following samples as can be reasonably achieved. Detailed information can be found in the most current revision of the associated SOP.

This laboratory report is confidential and is intended for the sole use of Eurofins TestAmerica and its client.

Revision 1- Updated isotopic thorium to report DLC.

Revision 2- Additional information requested in case narrative for total strontium

# Case Narrative

Page 25 of 72

Client: Aptim Federal Services LLC  
Project/Site: HPNS-Parcel G 501197

Job ID: 160-40596-1  
SDG: GJ46599740

## Job ID: 160-40596-1 (Continued)

### Laboratory: Eurofins TestAmerica, St. Louis (Continued)

#### RECEIPT

The samples were received on 11/27/2020; the samples arrived in good condition, properly preserved. The temperature of the coolers at receipt was 15.6 C.

#### STRONTIUM-90 (GFPC)

Samples HPPG-ESU-TU107B-001 (160-40596-1), HPPG-ESU-TU107B-011 (160-40596-11) and HPPG-ESU-TU107B-021 (160-40596-21) were analyzed for Strontium-90 (GFPC) in accordance with EPA 905. The samples were dried on 12/01/2020, prepared on 12/09/2020 and analyzed on 12/18/2020.

When taking small mass aliquots from dried/disaggregated sample, the laboratory avoids large rocks/pebbles (as well as sticks, etc) which may constitute a larger than representative portion of the aliquot. Smaller rocks may be included. This is consistent with QSM and Laboratory SOP: HPPG-ESU-TU107B-001 (160-40596-1), HPPG-ESU-TU107B-011 (160-40596-11) and HPPG-ESU-TU107B-021 (160-40596-21).

The method blank (MB) z-score is within limits and is stored in the level IV raw data. (MB 160-491323/23-A)

No analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

#### ISOTOPIC THORIUM (ALPHA SPECTROMETRY)

Samples HPPG-ESU-TU107B-001 (160-40596-1), HPPG-ESU-TU107B-011 (160-40596-11) and HPPG-ESU-TU107B-021 (160-40596-21) were analyzed for Isotopic Thorium (Alpha Spectrometry) in accordance with DOE A01R\_Th. The samples were dried on 12/01/2020, prepared on 12/15/2020 and analyzed on 12/30/2020.

A blank population correction was applied to account for contributions to the analyte count rate from sources other than the sample itself. Interferences may include, but are not limited to, impurities in reagents, tracers, or glassware, or effects due to the measurement process (such as tailing or crosstalk).HPPG-ESU-TU107B-001 (160-40596-1), HPPG-ESU-TU107B-011 (160-40596-11), HPPG-ESU-TU107B-021 (160-40596-21), (LCS 160-491944/2-A), (MB 160-491944/1-A), (160-40595-A-1-D) and (160-40595-A-1-E DU)

Results for the method blank (MB) are negative more than 3 times the 1 total propagated uncertainty (TPU). This appears to be random in nature, and does not affect the sample results. The magnitude of the negative results is minimal compared to the client sample results. The laboratory does not believe this excursion adversely affects the data.(MB 160-491944/1-A)

The calibration was performed in December therefore CCV was not needed. HPPG-ESU-TU107B-001 (160-40596-1).

No analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

#### RADIUM-226 BY GAMMA SPEC (21 DAY INGROWTH)

Samples HPPG-ESU-TU107B-001 (160-40596-1), HPPG-ESU-TU107B-002 (160-40596-2), HPPG-ESU-TU107B-003 (160-40596-3), HPPG-ESU-TU107B-004 (160-40596-4), HPPG-ESU-TU107B-005 (160-40596-5), HPPG-ESU-TU107B-006 (160-40596-6), HPPG-ESU-TU107B-007 (160-40596-7), HPPG-ESU-TU107B-008 (160-40596-8), HPPG-ESU-TU107B-009 (160-40596-9), HPPG-ESU-TU107B-010 (160-40596-10), HPPG-ESU-TU107B-011 (160-40596-11), HPPG-ESU-TU107B-012 (160-40596-12), HPPG-ESU-TU107B-013 (160-40596-13), HPPG-ESU-TU107B-014 (160-40596-14), HPPG-ESU-TU107B-015 (160-40596-15), HPPG-ESU-TU107B-016 (160-40596-16), HPPG-ESU-TU107B-017 (160-40596-17), HPPG-ESU-TU107B-018 (160-40596-18), HPPG-ESU-TU107B-019 (160-40596-19), HPPG-ESU-TU107B-020 (160-40596-20), HPPG-ESU-TU107B-021 (160-40596-21), HPPG-ESU-TU107B-022 (160-40596-22), HPPG-ESU-TU107B-023 (160-40596-23), HPPG-ESU-TU107B-024 (160-40596-24), HPPG-ESU-TU107B-025 (160-40596-25), HPPG-F-049 (160-40596-26) and HPPG-F-050 (160-40596-27) were analyzed for Radium-226 by gamma spec (21 day ingrowth) in accordance with EPA GA\_01\_R. The samples were dried on 12/01/2020, prepared on 12/03/2020 and 12/04/2020 and analyzed on 12/25/2020 and 12/30/2020.

Many isotopes requested for analysis do not have any gamma emissions, or the gamma emissions they do have are very poor. Often, such analytes are reported by gamma spectrometry assuming secular equilibrium with a longer-lived parent. The client should ensure that such inference is acceptable for their sample based upon process knowledge. The following assumptions were made for this report:

Inferred from    Reported to Analyte

## Case Narrative

Page 26 of 72

Client: Aptim Federal Services LLC  
Project/Site: HPNS-Parcel G 501197

Job ID: 160-40596-1  
SDG: GJ46599740

### Job ID: 160-40596-1 (Continued)

#### Laboratory: Eurofins TestAmerica, St. Louis (Continued)

Th-234	Pa-234
Th-234	U-238
Pb-210	Po-210
Pb-210	Bi-210
Cs-137	Ba-137m
Pb-212	Po-216
Xe-131m	Xe-131
Sb-125	Te-125m
Ag-108m	Ag-108
Rh-106	Ru-106
Pb-212	Th-228
Pb-212	Ra-224
U-235	Th-231
Ac-228	Th-232
Ac-228	Ra-228
Th-227	Ra-223
Th-227	Ac-227
Th-227	Bi-211
Th-227	Pb-211
Bi-214	Ra-226

Gamma prep batch 490932

The method blank (MB) z-score associated with Prep Batch 160-490932 is within limits and is stored in the level IV raw data. (MB 160-490932/1-A)

The cesium-137 detection goal of 0.0700 pCi/g was not met. This is caused by statistical fluctuations in the Compton background due to low level activity in the samples in conjunction with the software attempting to fit a peak into the noise of this baseline.  
HPPG-ESU-TU107B-020 (160-40596-20)

The following sample exhibited a negative result greater in magnitude than the 3 sigma TPU for Pb-210: HPPG-ESU-TU107B-021 (160-40596-21). This occurrence was evaluated and determined to be random in nature. Sporadic occurrences such as this are statistically expected. No further action is required.

Gamma Prep Batch 490832

The following sample exhibited a negative result greater in magnitude than the 3 sigma TPU for Pb-210: HPPG-ESU-TU107B-004 (160-40596-4). This occurrence was evaluated and determined to be random in nature. Sporadic occurrences such as this are statistically expected. No further action is required.

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.





# CHAIN OF CUSTODY

APTM Federal Services, LLC

4005 Port Chicago Hwy  
Concord, CA 94520

Project Manager: Lisa Bercik  
Phone #: (619)213-3389

Send Report to: Rose Condition  
Phone/Fax Number: 415-987-9711  
Address: 4005 Port Chicago Hwy  
City: Concord, CA 94521

Sample Lead: Lewis, Devim

Sample Tech(s): Andrew Mum  
Paul LeBlanc

Project Number: 501197

**Project Name:** Hunters Point Naval Shipyard: Parcel G Remedial Action

**Project Location:** San Francisco, CA

Purchase Order #: 1159058

**Shipment/Pickup Date:** 11/25/2020

Waybill Number: 4457 0225 6192

**Lab Destination:** Test America (St. Louis Lab)  
13715 Rider Trail North  
Earth City, MO 63046

Lab Contact Name/ph #: Rhonda Bidenhower (314)298-8566



# CHAIN OF CUSTODY

Ref. Document # 501197RSY-046

Page 3 of 4

APTIM Federal Services, LLC

4005 Port Chicago Hwy  
Concord, CA 94520Project Manager: Lisa Bercik  
Phone #: (619)213-3389Send Report to: Rose Condit  
Phone/Fax Number: 415-987-0760  
Address: 4005 Port Chicago Hwy  
City: Concord, CA 94520

Sample Lead: Lewis, Devin

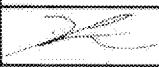
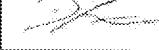
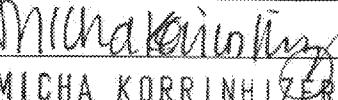
Sample Tech(s): Andrew Murn  
Paul LeBlanc

								Analysis Requested					
Project Number:		501197		Hunters Point Naval Shipyard: Parcel									
Project Name:		G Remedial Action											
Project Location:		San Francisco, CA											
Purchase Order #:		1159058											
Shipment/Pickup Date:		11/25/2020											
Waybill Number:		4957 0225 6192											
Lab Destination:		Test America (St. Louis Lab) 13715 Rider Trail North Earth City, MO 63046											
Lab Contact Name/ph #		Rhoeda Ridenbower (314)298-8566											

# All Transfers for COC 501197RSY-046

Page 30 of 72

Page 4 of 4

Relinquished By:	Relinquisher Signature:	Relinquish Date Time:	Received By:	Received Signature:	Receive Date Time:
Lewis, Devin		11/24/2020 17:00	Locked Storage(Kevin Hoch)		11/24/2020 17:00
Locked Storage(Kevin Hoch)		11/25/2020 07:39	Devin Lewis		11/25/2020 07:39
Devin Lewis		11/25/2020 11:35	SHIPPEDTOLAB	 MICHA KORRIN HIZER	11/27/2020 09:12

## Login Sample Receipt Checklist

Client: Aptim Federal Services LLC

Job Number: 160-40596-1  
SDG Number: GJ46599740**Login Number: 40596****List Source: Eurofins TestAmerica, St. Louis****List Number: 1****Creator: Greer, Diane A**

Question	Answer	Comment
Radioactivity wasn't checked or is </= background as measured by a survey meter.	True	
The cooler's custody seal, if present, is intact.	True	
Sample custody seals, if present, are intact.	True	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	N/A	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	True	
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time (excluding tests with immediate HTs)	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	True	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	True	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

# Definitions/Glossary

Page 32 of 72

Client: Aptim Federal Services LLC  
Project/Site: HPNS-Parcel G 501197

Job ID: 160-40596-1  
SDG: GJ46599740

## Qualifiers

Rad Qualifier	Qualifier Description
U	Undetected at the Limit of Detection.

## Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
%	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CFL	Contains Free Liquid
CFU	Colony Forming Unit
CNF	Contains No Free Liquid
DER	Duplicate Error Ratio (normalized absolute difference)
Dil Fac	Dilution Factor
DL	Detection Limit (DoD/DOE)
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision Level Concentration (Radiochemistry)
EDL	Estimated Detection Limit (Dioxin)
LOD	Limit of Detection (DoD/DOE)
LOQ	Limit of Quantitation (DoD/DOE)
MCL	EPA recommended "Maximum Contaminant Level"
MDA	Minimum Detectable Activity (Radiochemistry)
MDC	Minimum Detectable Concentration (Radiochemistry)
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
MPN	Most Probable Number
MQL	Method Quantitation Limit
NC	Not Calculated
ND	Not Detected at the reporting limit (or MDL or EDL if shown)
NEG	Negative / Absent
POS	Positive / Present
PQL	Practical Quantitation Limit
PRES	Presumptive
QC	Quality Control
RER	Relative Error Ratio (Radiochemistry)
RL	Reporting Limit or Requested Limit (Radiochemistry)
RPD	Relative Percent Difference, a measure of the relative difference between two points
TEF	Toxicity Equivalent Factor (Dioxin)
TEQ	Toxicity Equivalent Quotient (Dioxin)
TNTC	Too Numerous To Count

## Method Summary

Client: Aptim Federal Services LLC  
Project/Site: HPNS-Parcel G 501197

Page 33 of 72

Job ID: 160-40596-1  
SDG: GJ46599740

Method	Method Description	Protocol	Laboratory
905	Strontium-90 (GFPC)	EPA	TAL SL
A-01-R	Isotopic Thorium (Alpha Spectrometry)	DOE	TAL SL
GA-01-R	Radium-226 & Other Gamma Emitters (GS)	DOE	TAL SL
DPS-7	Preparation, Digestion/Precipitate Separation (7-Day In-Growth)	None	TAL SL
Dry and Grind	Preparation, Dry and Grind	None	TAL SL
ExtChrom	Preparation, Extraction Chromatography Resin Actinide Separation	None	TAL SL
Fill_Geo-21	Fill Geometry, 21-Day In-Growth	None	TAL SL

### Protocol References:

DOE = U.S. Department of Energy

EPA = US Environmental Protection Agency

None = None

### Laboratory References:

TAL SL = Eurofins TestAmerica, St. Louis, 13715 Rider Trail North, Earth City, MO 63045, TEL (314)298-8566

Eurofins TestAmerica, St. Louis

# Sample Summary

Page 34 of 72

Client: Aptim Federal Services LLC  
Project/Site: HPNS-Parcel G 501197

Job ID: 160-40596-1  
SDG: GJ46599740

Lab Sample ID	Client Sample ID	Matrix	Collected	Received	Asset ID
160-40596-1	HPPG-ESU-TU107B-001	Solid	11/24/20 15:22	11/27/20 09:12	
160-40596-2	HPPG-ESU-TU107B-002	Solid	11/24/20 15:23	11/27/20 09:12	
160-40596-3	HPPG-ESU-TU107B-003	Solid	11/24/20 15:25	11/27/20 09:12	
160-40596-4	HPPG-ESU-TU107B-004	Solid	11/24/20 15:26	11/27/20 09:12	
160-40596-5	HPPG-ESU-TU107B-005	Solid	11/24/20 15:28	11/27/20 09:12	
160-40596-6	HPPG-ESU-TU107B-006	Solid	11/24/20 15:29	11/27/20 09:12	
160-40596-7	HPPG-ESU-TU107B-007	Solid	11/24/20 15:31	11/27/20 09:12	
160-40596-8	HPPG-ESU-TU107B-008	Solid	11/24/20 15:33	11/27/20 09:12	
160-40596-9	HPPG-ESU-TU107B-009	Solid	11/24/20 15:34	11/27/20 09:12	
160-40596-10	HPPG-ESU-TU107B-010	Solid	11/24/20 15:36	11/27/20 09:12	
160-40596-11	HPPG-ESU-TU107B-011	Solid	11/24/20 15:37	11/27/20 09:12	
160-40596-12	HPPG-ESU-TU107B-012	Solid	11/24/20 15:39	11/27/20 09:12	
160-40596-13	HPPG-ESU-TU107B-013	Solid	11/24/20 15:40	11/27/20 09:12	
160-40596-14	HPPG-ESU-TU107B-014	Solid	11/24/20 15:41	11/27/20 09:12	
160-40596-15	HPPG-ESU-TU107B-015	Solid	11/24/20 15:43	11/27/20 09:12	
160-40596-16	HPPG-ESU-TU107B-016	Solid	11/24/20 15:44	11/27/20 09:12	
160-40596-17	HPPG-ESU-TU107B-017	Solid	11/24/20 15:45	11/27/20 09:12	
160-40596-18	HPPG-ESU-TU107B-018	Solid	11/24/20 15:47	11/27/20 09:12	
160-40596-19	HPPG-ESU-TU107B-019	Solid	11/24/20 15:48	11/27/20 09:12	
160-40596-20	HPPG-ESU-TU107B-020	Solid	11/24/20 15:51	11/27/20 09:12	
160-40596-21	HPPG-ESU-TU107B-021	Solid	11/24/20 15:52	11/27/20 09:12	
160-40596-22	HPPG-ESU-TU107B-022	Solid	11/24/20 15:53	11/27/20 09:12	
160-40596-23	HPPG-ESU-TU107B-023	Solid	11/24/20 15:55	11/27/20 09:12	
160-40596-24	HPPG-ESU-TU107B-024	Solid	11/24/20 15:57	11/27/20 09:12	
160-40596-25	HPPG-ESU-TU107B-025	Solid	11/24/20 16:01	11/27/20 09:12	
160-40596-26	HPPG-F-049	Solid	11/24/20 15:26	11/27/20 09:12	
160-40596-27	HPPG-F-050	Solid	11/24/20 15:44	11/27/20 09:12	

Eurofins TestAmerica, St. Louis

# Client Sample Results

Page 35 of 72

Client: Aptim Federal Services LLC  
Project/Site: HPNS-Parcel G 501197

Job ID: 160-40596-1  
SDG: GJ46599740

**Client Sample ID: HPPG-ESU-TU107B-001**

**Lab Sample ID: 160-40596-1**

Matrix: Solid

Date Collected: 11/24/20 15:22  
Date Received: 11/27/20 09:12

## Method: 905 - Strontium-90 (GFPC)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			Uncert. (2σ+/-)	Uncert. (2σ+/-)						
Strontium-90	0.270		0.160	0.162	0.331	0.111	pCi/g	12/09/20 18:42	12/18/20 20:14	1
<i>Carrier</i>	%Yield	Qualifier	<i>Limits</i>					<i>Prepared</i>	<i>Analyzed</i>	<i>Dil Fac</i>
Sr Carrier	97.1		40 - 110					12/09/20 18:42	12/18/20 20:14	1
Y Carrier	96.8		40 - 110					12/09/20 18:42	12/18/20 20:14	1

## Method: A-01-R - Isotopic Thorium (Alpha Spectrometry)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			Uncert. (2σ+/-)	Uncert. (2σ+/-)						
Thorium-228	0.322		0.0647	0.0702	0.250	0.0213	pCi/g	12/15/20 14:37	12/30/20 10:45	1
Thorium-230	0.276		0.0678	0.0717	0.250	0.0257	pCi/g	12/15/20 14:37	12/30/20 10:45	1
Thorium-232	0.357		0.0605	0.0675	0.250	0.00887	pCi/g	12/15/20 14:37	12/30/20 10:45	1
<i>Tracer</i>	%Yield	Qualifier	<i>Limits</i>					<i>Prepared</i>	<i>Analyzed</i>	<i>Dil Fac</i>
Thorium-229	70.1		30 - 110					12/15/20 14:37	12/30/20 10:45	1

## Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			Uncert. (2σ+/-)	Uncert. (2σ+/-)						
Actinium 228	0.486		0.134	0.142		0.0214	pCi/g	12/03/20 14:31	12/30/20 06:34	1
Actinium-227	-0.00489	U	0.0217	0.0217		0.308	pCi/g	12/03/20 14:31	12/30/20 06:34	1
Bismuth-212	0.258	U	0.449	0.450		0.340	pCi/g	12/03/20 14:31	12/30/20 06:34	1
<b>Bismuth-214</b>	<b>0.400</b>		0.103	0.111		0.0396	pCi/g	12/03/20 14:31	12/30/20 06:34	1
Cesium-137	0.00122	U	0.0351	0.0351	0.0700	0.0288	pCi/g	12/03/20 14:31	12/30/20 06:34	1
Lead-210	0.0517	U	1.10	1.10		0.903	pCi/g	12/03/20 14:31	12/30/20 06:34	1
<b>Lead-212</b>	<b>0.319</b>		0.0686	0.0800		0.0341	pCi/g	12/03/20 14:31	12/30/20 06:34	1
Lead-214	0.367		0.0934	0.101		0.0398	pCi/g	12/03/20 14:31	12/30/20 06:34	1
Potassium-40	7.65		1.09	1.35		0.240	pCi/g	12/03/20 14:31	12/30/20 06:34	1
Protactinium-231	0.000	U	0.452	0.452		1.66	pCi/g	12/03/20 14:31	12/30/20 06:34	1
Protactinium-234	-0.0783	U	0.224	0.224		0.182	pCi/g	12/03/20 14:31	12/30/20 06:34	1
<b>Radium-226</b>	<b>0.400</b>		0.103	0.111	0.200	0.0396	pCi/g	12/03/20 14:31	12/30/20 06:34	1
Radium-228	0.486		0.134	0.142		0.0214	pCi/g	12/03/20 14:31	12/30/20 06:34	1
Thallium-208	0.143		0.0376	0.0404		0.0102	pCi/g	12/03/20 14:31	12/30/20 06:34	1
<b>Thorium 228</b>	<b>0.319</b>		0.0686	0.0800		0.0341	pCi/g	12/03/20 14:31	12/30/20 06:34	1
<b>Thorium-232</b>	<b>0.486</b>		0.134	0.142		0.0214	pCi/g	12/03/20 14:31	12/30/20 06:34	1
<b>Thorium-234</b>	<b>0.439</b>		0.291	0.295		0.204	pCi/g	12/03/20 14:31	12/30/20 06:34	1
Uranium-235	0.0867	U	0.173	0.173		0.329	pCi/g	12/03/20 14:31	12/30/20 06:34	1
Uranium-238	0.439		0.291	0.295		0.204	pCi/g	12/03/20 14:31	12/30/20 06:34	1

Eurofins TestAmerica, St. Louis

# Client Sample Results

Page 36 of 72

Client: Aptim Federal Services LLC  
Project/Site: HPNS-Parcel G 501197

Job ID: 160-40596-1  
SDG: GJ46599740

**Client Sample ID: HPPG-ESU-TU107B-002**

**Lab Sample ID: 160-40596-2**

Date Collected: 11/24/20 15:23

Matrix: Solid

Date Received: 11/27/20 09:12

## Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			(2σ+/-)	(2σ+/-)						
Actinium 228	0.351		0.124	0.129		0.0858	pCi/g	12/03/20 14:31	12/30/20 07:03	1
Actinium-227	0.122	U	0.235	0.236		0.227	pCi/g	12/03/20 14:31	12/30/20 07:03	1
Bismuth-212	0.00443	U	0.504	0.504		0.415	pCi/g	12/03/20 14:31	12/30/20 07:03	1
Bismuth-214	0.333		0.0922	0.0985		0.0383	pCi/g	12/03/20 14:31	12/30/20 07:03	1
Cesium-137	0.0710		0.0297	0.0306	0.0700	0.0132	pCi/g	12/03/20 14:31	12/30/20 07:03	1
Lead-210	0.449	U	0.979	0.980		0.783	pCi/g	12/03/20 14:31	12/30/20 07:03	1
Lead-212	0.387		0.0659	0.0828		0.0272	pCi/g	12/03/20 14:31	12/30/20 07:03	1
Lead-214	0.291		0.0768	0.0825		0.0344	pCi/g	12/03/20 14:31	12/30/20 07:03	1
Potassium-40	6.84		0.997	1.22		0.161	pCi/g	12/03/20 14:31	12/30/20 07:03	1
Protactinium-231	0.386	U	1.20	1.20		1.31	pCi/g	12/03/20 14:31	12/30/20 07:03	1
Protactinium-234	-0.0870	U	0.240	0.240		0.196	pCi/g	12/03/20 14:31	12/30/20 07:03	1
Radium-226	0.333		0.0922	0.0985	0.200	0.0383	pCi/g	12/03/20 14:31	12/30/20 07:03	1
Radium-228	0.351		0.124	0.129		0.0858	pCi/g	12/03/20 14:31	12/30/20 07:03	1
Thallium-208	0.171		0.0415	0.0452		0.00958	pCi/g	12/03/20 14:31	12/30/20 07:03	1
Thorium 228	0.387		0.0659	0.0828		0.0272	pCi/g	12/03/20 14:31	12/30/20 07:03	1
Thorium-232	0.351		0.124	0.129		0.0858	pCi/g	12/03/20 14:31	12/30/20 07:03	1
Thorium-234	-0.263	U	0.940	0.941		0.769	pCi/g	12/03/20 14:31	12/30/20 07:03	1
Uranium-235	0.0675	U	0.259	0.259		0.211	pCi/g	12/03/20 14:31	12/30/20 07:03	1
Uranium-238	-0.263	U	0.940	0.941		0.769	pCi/g	12/03/20 14:31	12/30/20 07:03	1

**Client Sample ID: HPPG-ESU-TU107B-003**

**Lab Sample ID: 160-40596-3**

Date Collected: 11/24/20 15:25

Matrix: Solid

Date Received: 11/27/20 09:12

## Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			(2σ+/-)	(2σ+/-)						
Actinium 228	0.484		0.180	0.187		0.0638	pCi/g	12/03/20 14:31	12/30/20 06:59	1
Actinium-227	0.122	U	0.345	0.345		0.292	pCi/g	12/03/20 14:31	12/30/20 06:59	1
Bismuth-212	-0.0266	U	0.750	0.750		0.615	pCi/g	12/03/20 14:31	12/30/20 06:59	1
Bismuth-214	0.366		0.130	0.135		0.0656	pCi/g	12/03/20 14:31	12/30/20 06:59	1
Cesium-137	0.000	U	0.00935	0.00935	0.0700	0.0400	pCi/g	12/03/20 14:31	12/30/20 06:59	1
Lead-210	-1.20	U	1.72	1.72		1.46	pCi/g	12/03/20 14:31	12/30/20 06:59	1
Lead-212	0.390		0.0886	0.0975		0.0453	pCi/g	12/03/20 14:31	12/30/20 06:59	1
Lead-214	0.435		0.111	0.120		0.0482	pCi/g	12/03/20 14:31	12/30/20 06:59	1
Potassium-40	7.88		1.22	1.46		0.111	pCi/g	12/03/20 14:31	12/30/20 06:59	1
Protactinium-231	-0.822	U	2.81	2.81		2.29	pCi/g	12/03/20 14:31	12/30/20 06:59	1
Protactinium-234	0.126	U	0.234	0.234		0.192	pCi/g	12/03/20 14:31	12/30/20 06:59	1
Radium-226	0.366		0.130	0.135	0.200	0.0656	pCi/g	12/03/20 14:31	12/30/20 06:59	1
Radium-228	0.484		0.180	0.187		0.0638	pCi/g	12/03/20 14:31	12/30/20 06:59	1
Thallium-208	0.182		0.0516	0.0548		0.0123	pCi/g	12/03/20 14:31	12/30/20 06:59	1
Thorium 228	0.390		0.0886	0.0975		0.0453	pCi/g	12/03/20 14:31	12/30/20 06:59	1
Thorium-232	0.484		0.180	0.187		0.0638	pCi/g	12/03/20 14:31	12/30/20 06:59	1
Thorium-234	0.227	U	0.270	0.271		0.865	pCi/g	12/03/20 14:31	12/30/20 06:59	1
Uranium-235	0.100	U	0.0968	0.0974		0.264	pCi/g	12/03/20 14:31	12/30/20 06:59	1
Uranium-238	0.227	U	0.270	0.271		0.865	pCi/g	12/03/20 14:31	12/30/20 06:59	1

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# Client Sample Results

Page 37 of 72

Client: Aptim Federal Services LLC  
Project/Site: HPNS-Parcel G 501197

Job ID: 160-40596-1  
SDG: GJ46599740

**Client Sample ID: HPPG-ESU-TU107B-004**  
Date Collected: 11/24/20 15:26  
Date Received: 11/27/20 09:12

**Lab Sample ID: 160-40596-4**  
Matrix: Solid

## Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			(2σ+/-)	(2σ+/-)						
Actinium 228	0.487		0.165	0.172		0.0308	pCi/g	12/03/20 14:31	12/30/20 06:57	1
Actinium-227	0.143	U	0.282	0.283		0.372	pCi/g	12/03/20 14:31	12/30/20 06:57	1
Bismuth-212	-0.0413	U	0.666	0.666		0.544	pCi/g	12/03/20 14:31	12/30/20 06:57	1
<b>Bismuth-214</b>	<b>0.432</b>		0.131	0.139		0.0497	pCi/g	12/03/20 14:31	12/30/20 06:57	1
Cesium-137	-0.0209	U	0.0568	0.0568	0.0700	0.0447	pCi/g	12/03/20 14:31	12/30/20 06:57	1
Lead-210	-1.54	U	0.715	0.738		1.46	pCi/g	12/03/20 14:31	12/30/20 06:57	1
<b>Lead-212</b>	<b>0.302</b>		0.0838	0.0925		0.0480	pCi/g	12/03/20 14:31	12/30/20 06:57	1
Lead-214	0.291		0.111	0.115		0.0676	pCi/g	12/03/20 14:31	12/30/20 06:57	1
<b>Potassium-40</b>	<b>7.36</b>		1.29	1.49		0.229	pCi/g	12/03/20 14:31	12/30/20 06:57	1
Protactinium-231	0.101	U	1.18	1.18		1.92	pCi/g	12/03/20 14:31	12/30/20 06:57	1
Protactinium-234	0.101	U	0.225	0.226		0.190	pCi/g	12/03/20 14:31	12/30/20 06:57	1
Radium-226	0.432		0.131	0.139	0.200	0.0497	pCi/g	12/03/20 14:31	12/30/20 06:57	1
Radium-228	0.487		0.165	0.172		0.0308	pCi/g	12/03/20 14:31	12/30/20 06:57	1
Thallium-208	0.124		0.0570	0.0585		0.0244	pCi/g	12/03/20 14:31	12/30/20 06:57	1
<b>Thorium 228</b>	<b>0.302</b>		0.0838	0.0925		0.0480	pCi/g	12/03/20 14:31	12/30/20 06:57	1
<b>Thorium-232</b>	<b>0.487</b>		0.165	0.172		0.0308	pCi/g	12/03/20 14:31	12/30/20 06:57	1
Thorium-234	-0.0311	U	1.18	1.18		0.969	pCi/g	12/03/20 14:31	12/30/20 06:57	1
Uranium-235	0.145	U	0.347	0.347		0.303	pCi/g	12/03/20 14:31	12/30/20 06:57	1
Uranium-238	-0.0311	U	1.18	1.18		0.969	pCi/g	12/03/20 14:31	12/30/20 06:57	1

**Client Sample ID: HPPG-ESU-TU107B-005**

Date Collected: 11/24/20 15:28  
Date Received: 11/27/20 09:12

**Lab Sample ID: 160-40596-5**

Matrix: Solid

## Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			(2σ+/-)	(2σ+/-)						
Actinium 228	0.401		0.144	0.151		0.0301	pCi/g	12/03/20 14:31	12/30/20 07:09	1
<b>Actinium-227</b>	<b>0.556</b>		0.416	0.421		0.223	pCi/g	12/03/20 14:31	12/30/20 07:09	1
Bismuth-212	0.000	U	0.168	0.168		0.470	pCi/g	12/03/20 14:31	12/30/20 07:09	1
<b>Bismuth-214</b>	<b>0.342</b>		0.114	0.120		0.0452	pCi/g	12/03/20 14:31	12/30/20 07:09	1
Cesium-137	0.0304	U	0.0615	0.0616	0.0700	0.0477	pCi/g	12/03/20 14:31	12/30/20 07:09	1
Lead-210	1.13		1.27	1.28		0.842	pCi/g	12/03/20 14:31	12/30/20 07:09	1
<b>Lead-212</b>	<b>0.246</b>		0.0831	0.0880		0.0509	pCi/g	12/03/20 14:31	12/30/20 07:09	1
Lead-214	0.373		0.121	0.128		0.0662	pCi/g	12/03/20 14:31	12/30/20 07:09	1
<b>Potassium-40</b>	<b>7.98</b>		1.31	1.60		0.266	pCi/g	12/03/20 14:31	12/30/20 07:09	1
Protactinium-231	0.000	U	0.652	0.652		2.32	pCi/g	12/03/20 14:31	12/30/20 07:09	1
Protactinium-234	0.0938	U	0.284	0.285		0.231	pCi/g	12/03/20 14:31	12/30/20 07:09	1
Radium-226	0.342		0.114	0.120	0.200	0.0452	pCi/g	12/03/20 14:31	12/30/20 07:09	1
Radium-228	0.401		0.144	0.151		0.0301	pCi/g	12/03/20 14:31	12/30/20 07:09	1
Thallium-208	0.0987		0.0507	0.0520		0.0247	pCi/g	12/03/20 14:31	12/30/20 07:09	1
<b>Thorium 228</b>	<b>0.246</b>		0.0831	0.0880		0.0509	pCi/g	12/03/20 14:31	12/30/20 07:09	1
<b>Thorium-232</b>	<b>0.401</b>		0.144	0.151		0.0301	pCi/g	12/03/20 14:31	12/30/20 07:09	1
Thorium-234	-0.571	U	0.609	0.613		0.555	pCi/g	12/03/20 14:31	12/30/20 07:09	1
Uranium-235	-0.199	U	0.325	0.326		0.426	pCi/g	12/03/20 14:31	12/30/20 07:09	1
Uranium-238	-0.571	U	0.609	0.613		0.555	pCi/g	12/03/20 14:31	12/30/20 07:09	1

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# Client Sample Results

Page 38 of 72

Client: Aptim Federal Services LLC  
Project/Site: HPNS-Parcel G 501197

Job ID: 160-40596-1  
SDG: GJ46599740

**Client Sample ID: HPPG-ESU-TU107B-006**

**Lab Sample ID: 160-40596-6**

Date Collected: 11/24/20 15:29

Matrix: Solid

Date Received: 11/27/20 09:12

## Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			Uncert. (2σ+/-)	Uncert. (2σ+/-)						
Actinium 228	0.413		0.131	0.137		0.0240	pCi/g	12/03/20 14:31	12/30/20 07:46	1
Actinium-227	0.157	U	0.243	0.244		0.228	pCi/g	12/03/20 14:31	12/30/20 07:46	1
Bismuth-212	-0.0000000	U	0.576	0.576		0.474	pCi/g	12/03/20 14:31	12/30/20 07:46	1
	0399									
<b>Bismuth-214</b>	<b>0.382</b>		0.127	0.133		0.0485	pCi/g	12/03/20 14:31	12/30/20 07:46	1
Cesium-137	-0.0180	U	0.0523	0.0523	0.0700	0.0415	pCi/g	12/03/20 14:31	12/30/20 07:46	1
Lead-210	0.198	U	1.02	1.02		0.814	pCi/g	12/03/20 14:31	12/30/20 07:46	1
Lead-212	0.00735	U	0.0943	0.0943		0.0771	pCi/g	12/03/20 14:31	12/30/20 07:46	1
<b>Lead-214</b>	<b>0.355</b>		0.0962	0.103		0.0394	pCi/g	12/03/20 14:31	12/30/20 07:46	1
Potassium-40	7.15		1.11	1.33		0.223	pCi/g	12/03/20 14:31	12/30/20 07:46	1
Protactinium-231	0.000	U	0.721	0.721		1.90	pCi/g	12/03/20 14:31	12/30/20 07:46	1
Protactinium-234	0.0697	U	0.0958	0.0961		0.217	pCi/g	12/03/20 14:31	12/30/20 07:46	1
<b>Radium-226</b>	<b>0.382</b>		0.127	0.133	0.200	0.0485	pCi/g	12/03/20 14:31	12/30/20 07:46	1
<b>Radium-228</b>	<b>0.413</b>		0.131	0.137		0.0240	pCi/g	12/03/20 14:31	12/30/20 07:46	1
<b>Thallium-208</b>	<b>0.163</b>		0.0438	0.0470		0.0127	pCi/g	12/03/20 14:31	12/30/20 07:46	1
Thorium 228	0.00735	U	0.0943	0.0943		0.0771	pCi/g	12/03/20 14:31	12/30/20 07:46	1
<b>Thorium-232</b>	<b>0.413</b>		0.131	0.137		0.0240	pCi/g	12/03/20 14:31	12/30/20 07:46	1
Thorium-234	0.298	U	0.504	0.505		0.397	pCi/g	12/03/20 14:31	12/30/20 07:46	1
Uranium-235	0.0691	U	0.470	0.470		0.385	pCi/g	12/03/20 14:31	12/30/20 07:46	1
Uranium-238	0.298	U	0.504	0.505		0.397	pCi/g	12/03/20 14:31	12/30/20 07:46	1

**Client Sample ID: HPPG-ESU-TU107B-007**

**Lab Sample ID: 160-40596-7**

Date Collected: 11/24/20 15:31

Matrix: Solid

Date Received: 11/27/20 09:12

## Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			Uncert. (2σ+/-)	Uncert. (2σ+/-)						
Actinium 228	0.275		0.188	0.190		0.0789	pCi/g	12/03/20 14:31	12/30/20 07:31	1
Actinium-227	0.223	U	0.416	0.417		0.234	pCi/g	12/03/20 14:31	12/30/20 07:31	1
Bismuth-212	-0.335	U	0.888	0.889		0.704	pCi/g	12/03/20 14:31	12/30/20 07:31	1
Bismuth-214	0.103	U	0.101	0.102		0.159	pCi/g	12/03/20 14:31	12/30/20 07:31	1
Cesium-137	-0.0188	U	0.0572	0.0572	0.0700	0.0451	pCi/g	12/03/20 14:31	12/30/20 07:31	1
Lead-210	-0.00413	U	1.51	1.51		1.23	pCi/g	12/03/20 14:31	12/30/20 07:31	1
<b>Lead-212</b>	<b>0.266</b>		0.0924	0.0987		0.0590	pCi/g	12/03/20 14:31	12/30/20 07:31	1
<b>Lead-214</b>	<b>0.473</b>		0.120	0.130		0.0393	pCi/g	12/03/20 14:31	12/30/20 07:31	1
Potassium-40	8.14		1.39	1.62		0.243	pCi/g	12/03/20 14:31	12/30/20 07:31	1
Protactinium-231	0.000	U	0.277	0.277		2.12	pCi/g	12/03/20 14:31	12/30/20 07:31	1
Protactinium-234	0.0850	U	0.237	0.238		0.193	pCi/g	12/03/20 14:31	12/30/20 07:31	1
Radium-226	0.103	U	0.101	0.102	0.200	0.159	pCi/g	12/03/20 14:31	12/30/20 07:31	1
<b>Radium-228</b>	<b>0.275</b>		0.188	0.190		0.0789	pCi/g	12/03/20 14:31	12/30/20 07:31	1
<b>Thallium-208</b>	<b>0.154</b>		0.0495	0.0521		0.0151	pCi/g	12/03/20 14:31	12/30/20 07:31	1
<b>Thorium 228</b>	<b>0.266</b>		0.0924	0.0987		0.0590	pCi/g	12/03/20 14:31	12/30/20 07:31	1
<b>Thorium-232</b>	<b>0.275</b>		0.188	0.190		0.0789	pCi/g	12/03/20 14:31	12/30/20 07:31	1
Thorium-234	-0.416	U	0.788	0.789		0.970	pCi/g	12/03/20 14:31	12/30/20 07:31	1
Uranium-235	0.0921	U	0.177	0.178		0.364	pCi/g	12/03/20 14:31	12/30/20 07:31	1
Uranium-238	-0.416	U	0.788	0.789		0.970	pCi/g	12/03/20 14:31	12/30/20 07:31	1

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# Client Sample Results

Page 39 of 72

Client: Aptim Federal Services LLC  
Project/Site: HPNS-Parcel G 501197

Job ID: 160-40596-1  
SDG: GJ46599740

**Client Sample ID: HPPG-ESU-TU107B-008**  
Date Collected: 11/24/20 15:33  
Date Received: 11/27/20 09:12

**Lab Sample ID: 160-40596-8**  
Matrix: Solid

## Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			(2σ+/-)	(2σ+/-)						
Actinium 228	0.592		0.139	0.151		0.0288	pCi/g	12/03/20 14:31	12/30/20 07:34	1
Actinium-227	0.220	U	0.426	0.426		0.252	pCi/g	12/03/20 14:31	12/30/20 07:34	1
Bismuth-212	-0.0135	U	0.700	0.700		0.575	pCi/g	12/03/20 14:31	12/30/20 07:34	1
<b>Bismuth-214</b>	<b>0.394</b>		0.127	0.133		0.0564	pCi/g	12/03/20 14:31	12/30/20 07:34	1
Cesium-137	-0.0490	U	0.0819	0.0820	0.0700	0.0641	pCi/g	12/03/20 14:31	12/30/20 07:34	1
Lead-210	0.856	U		1.21		0.925	pCi/g	12/03/20 14:31	12/30/20 07:34	1
<b>Lead-212</b>	<b>0.392</b>		0.0882	0.0972		0.0442	pCi/g	12/03/20 14:31	12/30/20 07:34	1
Lead-214	0.457		0.101	0.111		0.0523	pCi/g	12/03/20 14:31	12/30/20 07:34	1
Potassium-40	8.35		1.27	1.52		0.112	pCi/g	12/03/20 14:31	12/30/20 07:34	1
Protactinium-231	0.214	U	1.39	1.39		2.16	pCi/g	12/03/20 14:31	12/30/20 07:34	1
Protactinium-234	0.00829	U	0.0153	0.0154		0.248	pCi/g	12/03/20 14:31	12/30/20 07:34	1
Radium-226	0.394		0.127	0.133	0.200	0.0564	pCi/g	12/03/20 14:31	12/30/20 07:34	1
Radium-228	0.592		0.139	0.151		0.0288	pCi/g	12/03/20 14:31	12/30/20 07:34	1
Thallium-208	0.203		0.0499	0.0540		0.00716	pCi/g	12/03/20 14:31	12/30/20 07:34	1
Thorium 228	0.392		0.0882	0.0972		0.0442	pCi/g	12/03/20 14:31	12/30/20 07:34	1
Thorium-232	0.592		0.139	0.151		0.0288	pCi/g	12/03/20 14:31	12/30/20 07:34	1
Thorium-234	0.817		0.528	0.536		0.424	pCi/g	12/03/20 14:31	12/30/20 07:34	1
Uranium-235	0.0493	U	0.0778	0.0780		0.443	pCi/g	12/03/20 14:31	12/30/20 07:34	1
Uranium-238	0.817		0.528	0.536		0.424	pCi/g	12/03/20 14:31	12/30/20 07:34	1

**Client Sample ID: HPPG-ESU-TU107B-009**

Date Collected: 11/24/20 15:34  
Date Received: 11/27/20 09:12

**Lab Sample ID: 160-40596-9**

Matrix: Solid

## Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			(2σ+/-)	(2σ+/-)						
Actinium 228	0.464		0.131	0.140		0.0210	pCi/g	12/03/20 14:31	12/30/20 07:36	1
Actinium-227	0.206	U	0.415	0.416		0.238	pCi/g	12/03/20 14:31	12/30/20 07:36	1
Bismuth-212	0.164	U	0.442	0.443		0.346	pCi/g	12/03/20 14:31	12/30/20 07:36	1
<b>Bismuth-214</b>	<b>0.303</b>		0.110	0.115		0.0525	pCi/g	12/03/20 14:31	12/30/20 07:36	1
Cesium-137	-0.0194	U	0.0480	0.0481	0.0700	0.0379	pCi/g	12/03/20 14:31	12/30/20 07:36	1
Lead-210	-0.595	U	1.29	1.29		1.04	pCi/g	12/03/20 14:31	12/30/20 07:36	1
<b>Lead-212</b>	<b>0.377</b>		0.0672	0.0830		0.0268	pCi/g	12/03/20 14:31	12/30/20 07:36	1
Lead-214	0.369		0.0877	0.0957		0.0376	pCi/g	12/03/20 14:31	12/30/20 07:36	1
Potassium-40	6.85		1.15	1.35		0.287	pCi/g	12/03/20 14:31	12/30/20 07:36	1
Protactinium-231	0.266	U	0.979	0.979		1.53	pCi/g	12/03/20 14:31	12/30/20 07:36	1
Protactinium-234	-0.0158	U	0.0379	0.0380		0.191	pCi/g	12/03/20 14:31	12/30/20 07:36	1
Radium-226	0.303		0.110	0.115	0.200	0.0525	pCi/g	12/03/20 14:31	12/30/20 07:36	1
Radium-228	0.464		0.131	0.140		0.0210	pCi/g	12/03/20 14:31	12/30/20 07:36	1
Thallium-208	0.194		0.0413	0.0459		0.00512	pCi/g	12/03/20 14:31	12/30/20 07:36	1
Thorium 228	0.377		0.0672	0.0830		0.0268	pCi/g	12/03/20 14:31	12/30/20 07:36	1
Thorium-232	0.464		0.131	0.140		0.0210	pCi/g	12/03/20 14:31	12/30/20 07:36	1
Thorium-234	0.420		0.323	0.326		0.236	pCi/g	12/03/20 14:31	12/30/20 07:36	1
Uranium-235	0.0699	U	0.159	0.160		0.351	pCi/g	12/03/20 14:31	12/30/20 07:36	1
Uranium-238	0.420		0.323	0.326		0.236	pCi/g	12/03/20 14:31	12/30/20 07:36	1

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# Client Sample Results

Page 40 of 72

Client: Aptim Federal Services LLC  
Project/Site: HPNS-Parcel G 501197

Job ID: 160-40596-1  
SDG: GJ46599740

**Client Sample ID: HPPG-ESU-TU107B-010**

**Lab Sample ID: 160-40596-10**

Date Collected: 11/24/20 15:36

Matrix: Solid

Date Received: 11/27/20 09:12

## Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			(2σ+/-)	(2σ+/-)						
Actinium 228	0.376		0.214	0.218		0.0810	pCi/g	12/03/20 14:31	12/30/20 07:37	1
Actinium-227	0.0585	U	0.256	0.256		0.310	pCi/g	12/03/20 14:31	12/30/20 07:37	1
Bismuth-212	-0.00400	U	0.939	0.939		0.689	pCi/g	12/03/20 14:31	12/30/20 07:37	1
<b>Bismuth-214</b>	<b>0.281</b>		0.146	0.149		0.0704	pCi/g	12/03/20 14:31	12/30/20 07:37	1
Cesium-137	-0.0457	U	0.0761	0.0763	0.0700	0.0618	pCi/g	12/03/20 14:31	12/30/20 07:37	1
Lead-210	-0.337	U		1.32		0.955	pCi/g	12/03/20 14:31	12/30/20 07:37	1
<b>Lead-212</b>	<b>0.378</b>		0.0834	0.0967		0.0328	pCi/g	12/03/20 14:31	12/30/20 07:37	1
Lead-214	0.301		0.0912	0.0964		0.0661	pCi/g	12/03/20 14:31	12/30/20 07:37	1
Potassium-40	6.95		1.54	1.70		0.434	pCi/g	12/03/20 14:31	12/30/20 07:37	1
Protactinium-231	0.355	U	1.36	1.36		1.50	pCi/g	12/03/20 14:31	12/30/20 07:37	1
Protactinium-234	0.161		0.107	0.108		0.137	pCi/g	12/03/20 14:31	12/30/20 07:37	1
Radium-226	0.281		0.146	0.149	0.200	0.0704	pCi/g	12/03/20 14:31	12/30/20 07:37	1
Radium-228	0.376		0.214	0.218		0.0810	pCi/g	12/03/20 14:31	12/30/20 07:37	1
Thallium-208	0.114		0.0506	0.0520		0.0200	pCi/g	12/03/20 14:31	12/30/20 07:37	1
Thorium 228	0.378		0.0834	0.0967		0.0328	pCi/g	12/03/20 14:31	12/30/20 07:37	1
Thorium-232	0.376		0.214	0.218		0.0810	pCi/g	12/03/20 14:31	12/30/20 07:37	1
Thorium-234	-0.175	U	0.820	0.821		0.681	pCi/g	12/03/20 14:31	12/30/20 07:37	1
Uranium-235	0.104	U	0.271	0.272		0.182	pCi/g	12/03/20 14:31	12/30/20 07:37	1
Uranium-238	-0.175	U	0.820	0.821		0.681	pCi/g	12/03/20 14:31	12/30/20 07:37	1

**Client Sample ID: HPPG-ESU-TU107B-011**

**Lab Sample ID: 160-40596-11**

Date Collected: 11/24/20 15:37

Matrix: Solid

Date Received: 11/27/20 09:12

## Method: 905 - Strontium-90 (GFPC)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			(2σ+/-)	(2σ+/-)						
Strontium-90	0.0186	U	0.141	0.141	0.331	0.114	pCi/g	12/09/20 18:42	12/18/20 20:14	1
<b>Carrier</b>	<b>%Yield</b>	<b>Qualifier</b>	<b>Limits</b>					<b>Prepared</b>	<b>Analyzed</b>	<b>Dil Fac</b>
Sr Carrier	97.1		40 - 110					12/09/20 18:42	12/18/20 20:14	1
Y Carrier	95.7		40 - 110					12/09/20 18:42	12/18/20 20:14	1

## Method: A-01-R - Isotopic Thorium (Alpha Spectrometry)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			(2σ+/-)	(2σ+/-)						
Thorium-228	0.331		0.0706	0.0759	0.250	0.0342	pCi/g	12/15/20 14:37	12/30/20 10:45	1
Thorium-230	0.247		0.0635	0.0668	0.250	0.0264	pCi/g	12/15/20 14:37	12/30/20 10:45	1
Thorium-232	0.318		0.0546	0.0608	0.250	0.00967	pCi/g	12/15/20 14:37	12/30/20 10:45	1
<b>Tracer</b>	<b>%Yield</b>	<b>Qualifier</b>	<b>Limits</b>					<b>Prepared</b>	<b>Analyzed</b>	<b>Dil Fac</b>
Thorium-229	78.8		30 - 110					12/15/20 14:37	12/30/20 10:45	1

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# Client Sample Results

Page 41 of 72

Client: Aptim Federal Services LLC  
Project/Site: HPNS-Parcel G 501197

Job ID: 160-40596-1  
SDG: GJ46599740

**Client Sample ID: HPPG-ESU-TU107B-011**

**Lab Sample ID: 160-40596-11**

Matrix: Solid

Date Collected: 11/24/20 15:37  
Date Received: 11/27/20 09:12

## Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			(2σ+/-)	(2σ+/-)						
Actinium 228	0.530		0.174	0.185		0.0334	pCi/g	12/03/20 14:31	12/30/20 07:45	1
Actinium-227	0.0781	U	0.373	0.374		0.318	pCi/g	12/03/20 14:31	12/30/20 07:45	1
Bismuth-212	0.421	U	0.753	0.754		0.575	pCi/g	12/03/20 14:31	12/30/20 07:45	1
<b>Bismuth-214</b>	<b>0.473</b>		0.120	0.132		0.0402	pCi/g	12/03/20 14:31	12/30/20 07:45	1
Cesium-137	0.0256	U	0.0603	0.0603	0.0700	0.0469	pCi/g	12/03/20 14:31	12/30/20 07:45	1
<b>Lead-210</b>	<b>0.985</b>		1.41	1.42		0.948	pCi/g	12/03/20 14:31	12/30/20 07:45	1
<b>Lead-212</b>	<b>0.372</b>		0.0995	0.109		0.0568	pCi/g	12/03/20 14:31	12/30/20 07:45	1
<b>Lead-214</b>	<b>0.237</b>		0.0814	0.0859		0.124	pCi/g	12/03/20 14:31	12/30/20 07:45	1
<b>Potassium-40</b>	<b>8.78</b>		1.45	1.76		0.295	pCi/g	12/03/20 14:31	12/30/20 07:45	1
Protactinium-231	0.000	U	0.175	0.175		2.48	pCi/g	12/03/20 14:31	12/30/20 07:45	1
Protactinium-234	-0.0187	U	0.0394	0.0395		0.278	pCi/g	12/03/20 14:31	12/30/20 07:45	1
Radium-226	0.473		0.120	0.132	0.200	0.0402	pCi/g	12/03/20 14:31	12/30/20 07:45	1
Radium-228	0.530		0.174	0.185		0.0334	pCi/g	12/03/20 14:31	12/30/20 07:45	1
Thallium-208	0.130		0.113	0.114		0.0511	pCi/g	12/03/20 14:31	12/30/20 07:45	1
<b>Thorium 228</b>	<b>0.372</b>		0.0995	0.109		0.0568	pCi/g	12/03/20 14:31	12/30/20 07:45	1
<b>Thorium-232</b>	<b>0.530</b>		0.174	0.185		0.0334	pCi/g	12/03/20 14:31	12/30/20 07:45	1
Thorium-234	-0.448	U	0.991	0.993		0.828	pCi/g	12/03/20 14:31	12/30/20 07:45	1
Uranium-235	-0.214	U	0.320	0.321		0.367	pCi/g	12/03/20 14:31	12/30/20 07:45	1
Uranium-238	-0.448	U	0.991	0.993		0.828	pCi/g	12/03/20 14:31	12/30/20 07:45	1

**Client Sample ID: HPPG-ESU-TU107B-012**

**Lab Sample ID: 160-40596-12**

Matrix: Solid

Date Collected: 11/24/20 15:39  
Date Received: 11/27/20 09:12

## Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			(2σ+/-)	(2σ+/-)						
Actinium 228	0.247		0.114	0.117		0.105	pCi/g	12/03/20 14:31	12/30/20 08:08	1
Actinium-227	0.0470	U	0.197	0.198		0.265	pCi/g	12/03/20 14:31	12/30/20 08:08	1
Bismuth-212	0.205	U	0.411	0.411		0.306	pCi/g	12/03/20 14:31	12/30/20 08:08	1
<b>Bismuth-214</b>	<b>0.351</b>		0.113	0.118		0.0478	pCi/g	12/03/20 14:31	12/30/20 08:08	1
Cesium-137	-0.0226	U	0.0494	0.0495	0.0700	0.0383	pCi/g	12/03/20 14:31	12/30/20 08:08	1
Lead-210	0.792	U	1.35	1.35		0.868	pCi/g	12/03/20 14:31	12/30/20 08:08	1
<b>Lead-212</b>	<b>0.313</b>		0.0785	0.0850		0.0408	pCi/g	12/03/20 14:31	12/30/20 08:08	1
<b>Lead-214</b>	<b>0.373</b>		0.102	0.109		0.0436	pCi/g	12/03/20 14:31	12/30/20 08:08	1
<b>Potassium-40</b>	<b>7.51</b>		1.17	1.39		0.105	pCi/g	12/03/20 14:31	12/30/20 08:08	1
Protactinium-231	0.188	U	1.30	1.30		2.01	pCi/g	12/03/20 14:31	12/30/20 08:08	1
Protactinium-234	0.0755	U	0.229	0.229		0.188	pCi/g	12/03/20 14:31	12/30/20 08:08	1
Radium-226	0.351		0.113	0.118	0.200	0.0478	pCi/g	12/03/20 14:31	12/30/20 08:08	1
Radium-228	0.247		0.114	0.117		0.105	pCi/g	12/03/20 14:31	12/30/20 08:08	1
Thallium-208	0.154		0.0515	0.0538		0.0140	pCi/g	12/03/20 14:31	12/30/20 08:08	1
<b>Thorium 228</b>	<b>0.313</b>		0.0785	0.0850		0.0408	pCi/g	12/03/20 14:31	12/30/20 08:08	1
<b>Thorium-232</b>	<b>0.247</b>		0.114	0.117		0.105	pCi/g	12/03/20 14:31	12/30/20 08:08	1
Thorium-234	-0.835	U	0.587	0.595		0.759	pCi/g	12/03/20 14:31	12/30/20 08:08	1
Uranium-235	0.0535	U	0.199	0.199		0.395	pCi/g	12/03/20 14:31	12/30/20 08:08	1
Uranium-238	-0.835	U	0.587	0.595		0.759	pCi/g	12/03/20 14:31	12/30/20 08:08	1

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# Client Sample Results

Page 42 of 72

Client: Aptim Federal Services LLC  
Project/Site: HPNS-Parcel G 501197

Job ID: 160-40596-1  
SDG: GJ46599740

**Client Sample ID: HPPG-ESU-TU107B-013**

**Lab Sample ID: 160-40596-13**

Date Collected: 11/24/20 15:40

Matrix: Solid

Date Received: 11/27/20 09:12

## Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			(2σ+/-)	(2σ+/-)						
Actinium 228	0.346		0.112	0.118		0.0582	pCi/g	12/03/20 14:31	12/30/20 08:09	1
Actinium-227	0.0648	U	0.370	0.370		0.218	pCi/g	12/03/20 14:31	12/30/20 08:09	1
Bismuth-212	0.204	U	0.351	0.352		0.264	pCi/g	12/03/20 14:31	12/30/20 08:09	1
<b>Bismuth-214</b>	<b>0.287</b>		0.0793	0.0847		0.0326	pCi/g	12/03/20 14:31	12/30/20 08:09	1
Cesium-137	-0.0304	U	0.0471	0.0472	0.0700	0.0365	pCi/g	12/03/20 14:31	12/30/20 08:09	1
Lead-210	0.118	U	0.789	0.789		0.642	pCi/g	12/03/20 14:31	12/30/20 08:09	1
<b>Lead-212</b>	<b>0.280</b>		0.0585	0.0688		0.0280	pCi/g	12/03/20 14:31	12/30/20 08:09	1
<b>Lead-214</b>	<b>0.261</b>		0.0728	0.0776		0.0480	pCi/g	12/03/20 14:31	12/30/20 08:09	1
<b>Potassium-40</b>	<b>6.92</b>		0.929	1.17		0.0727	pCi/g	12/03/20 14:31	12/30/20 08:09	1
Protactinium-231	-0.0000001	U	1.77	1.77		1.46	pCi/g	12/03/20 14:31	12/30/20 08:09	1
35										
Protactinium-234	0.0633	U	0.178	0.178		0.145	pCi/g	12/03/20 14:31	12/30/20 08:09	1
<b>Radium-226</b>	<b>0.287</b>		0.0793	0.0847	0.200	0.0326	pCi/g	12/03/20 14:31	12/30/20 08:09	1
<b>Radium-228</b>	<b>0.346</b>		0.112	0.118		0.0582	pCi/g	12/03/20 14:31	12/30/20 08:09	1
Thallium-208	0.137		0.0392	0.0417		0.0102	pCi/g	12/03/20 14:31	12/30/20 08:09	1
<b>Thorium 228</b>	<b>0.280</b>		0.0585	0.0688		0.0280	pCi/g	12/03/20 14:31	12/30/20 08:09	1
<b>Thorium-232</b>	<b>0.346</b>		0.112	0.118		0.0582	pCi/g	12/03/20 14:31	12/30/20 08:09	1
Thorium-234	-0.276	U	0.809	0.810		0.660	pCi/g	12/03/20 14:31	12/30/20 08:09	1
Uranium-235	0.0293	U	0.173	0.173		0.259	pCi/g	12/03/20 14:31	12/30/20 08:09	1
Uranium-238	-0.276	U	0.809	0.810		0.660	pCi/g	12/03/20 14:31	12/30/20 08:09	1

**Client Sample ID: HPPG-ESU-TU107B-014**

**Lab Sample ID: 160-40596-14**

Date Collected: 11/24/20 15:41

Matrix: Solid

Date Received: 11/27/20 09:12

## Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			(2σ+/-)	(2σ+/-)						
Actinium 228	0.379		0.211	0.215		0.0926	pCi/g	12/03/20 14:31	12/30/20 08:13	1
Actinium-227	-0.152	U	0.151	0.152		0.322	pCi/g	12/03/20 14:31	12/30/20 08:13	1
Bismuth-212	-0.0259	U	0.695	0.695		0.690	pCi/g	12/03/20 14:31	12/30/20 08:13	1
<b>Bismuth-214</b>	<b>0.353</b>		0.0809	0.0888		0.0108	pCi/g	12/03/20 14:31	12/30/20 08:13	1
Cesium-137	0.0182	U	0.0494	0.0495	0.0700	0.0391	pCi/g	12/03/20 14:31	12/30/20 08:13	1
Lead-210	-1.25	U	1.22	1.23		1.29	pCi/g	12/03/20 14:31	12/30/20 08:13	1
<b>Lead-212</b>	<b>0.286</b>		0.0718	0.0808		0.0386	pCi/g	12/03/20 14:31	12/30/20 08:13	1
<b>Lead-214</b>	<b>0.360</b>		0.0951	0.102		0.0389	pCi/g	12/03/20 14:31	12/30/20 08:13	1
<b>Potassium-40</b>	<b>7.81</b>		1.15	1.40		0.252	pCi/g	12/03/20 14:31	12/30/20 08:13	1
Protactinium-231	0.272	U	0.938	0.939		1.46	pCi/g	12/03/20 14:31	12/30/20 08:13	1
Protactinium-234	0.0439	U	0.0794	0.0795		0.157	pCi/g	12/03/20 14:31	12/30/20 08:13	1
<b>Radium-226</b>	<b>0.353</b>		0.0809	0.0888	0.200	0.0108	pCi/g	12/03/20 14:31	12/30/20 08:13	1
<b>Radium-228</b>	<b>0.379</b>		0.211	0.215		0.0926	pCi/g	12/03/20 14:31	12/30/20 08:13	1
Thallium-208	0.114		0.0432	0.0448		0.0171	pCi/g	12/03/20 14:31	12/30/20 08:13	1
<b>Thorium 228</b>	<b>0.286</b>		0.0718	0.0808		0.0386	pCi/g	12/03/20 14:31	12/30/20 08:13	1
<b>Thorium-232</b>	<b>0.379</b>		0.211	0.215		0.0926	pCi/g	12/03/20 14:31	12/30/20 08:13	1
Thorium-234	-0.320	U	0.744	0.744		0.690	pCi/g	12/03/20 14:31	12/30/20 08:13	1
<b>Uranium-235</b>	<b>0.183</b>		0.153	0.155		0.0967	pCi/g	12/03/20 14:31	12/30/20 08:13	1
Uranium-238	-0.320	U	0.744	0.744		0.690	pCi/g	12/03/20 14:31	12/30/20 08:13	1

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# Client Sample Results

Page 43 of 72

Client: Aptim Federal Services LLC  
Project/Site: HPNS-Parcel G 501197

Job ID: 160-40596-1  
SDG: GJ46599740

**Client Sample ID: HPPG-ESU-TU107B-015**

**Lab Sample ID: 160-40596-15**

Date Collected: 11/24/20 15:43

Matrix: Solid

Date Received: 11/27/20 09:12

## Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			(2σ+/-)	(2σ+/-)						
Actinium 228	0.343		0.185	0.189		0.0845	pCi/g	12/03/20 14:31	12/30/20 08:12	1
Actinium-227	0.137	U	0.362	0.363		0.305	pCi/g	12/03/20 14:31	12/30/20 08:12	1
Bismuth-212	-0.594	U	0.828	0.830		0.935	pCi/g	12/03/20 14:31	12/30/20 08:12	1
Bismuth-214	0.172	U	0.139	0.141		0.177	pCi/g	12/03/20 14:31	12/30/20 08:12	1
Cesium-137	-0.0351	U	0.128	0.128	0.0700	0.0611	pCi/g	12/03/20 14:31	12/30/20 08:12	1
Lead-210	0.572	U	1.30	1.30		0.894	pCi/g	12/03/20 14:31	12/30/20 08:12	1
<b>Lead-212</b>	<b>0.311</b>		0.0896	0.0982		0.0481	pCi/g	12/03/20 14:31	12/30/20 08:12	1
Lead-214	0.263		0.119	0.122		0.0813	pCi/g	12/03/20 14:31	12/30/20 08:12	1
<b>Potassium-40</b>	<b>6.53</b>		1.37	1.53		0.267	pCi/g	12/03/20 14:31	12/30/20 08:12	1
Protactinium-231	-0.879	U	2.83	2.83		2.30	pCi/g	12/03/20 14:31	12/30/20 08:12	1
Protactinium-234	0.00963	U	0.0250	0.0250		0.174	pCi/g	12/03/20 14:31	12/30/20 08:12	1
Radium-226	0.172	U	0.139	0.141	0.200	0.177	pCi/g	12/03/20 14:31	12/30/20 08:12	1
<b>Radium-228</b>	<b>0.343</b>		0.185	0.189		0.0845	pCi/g	12/03/20 14:31	12/30/20 08:12	1
<b>Thallium-208</b>	<b>0.160</b>		0.0538	0.0563		0.0148	pCi/g	12/03/20 14:31	12/30/20 08:12	1
<b>Thorium 228</b>	<b>0.311</b>		0.0896	0.0982		0.0481	pCi/g	12/03/20 14:31	12/30/20 08:12	1
<b>Thorium-232</b>	<b>0.343</b>		0.185	0.189		0.0845	pCi/g	12/03/20 14:31	12/30/20 08:12	1
Thorium-234	-0.115	U	0.842	0.842		0.697	pCi/g	12/03/20 14:31	12/30/20 08:12	1
Uranium-235	-0.0388	U	0.0688	0.0690		0.327	pCi/g	12/03/20 14:31	12/30/20 08:12	1
Uranium-238	-0.115	U	0.842	0.842		0.697	pCi/g	12/03/20 14:31	12/30/20 08:12	1

**Client Sample ID: HPPG-ESU-TU107B-016**

**Lab Sample ID: 160-40596-16**

Date Collected: 11/24/20 15:44

Matrix: Solid

Date Received: 11/27/20 09:12

## Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			(2σ+/-)	(2σ+/-)						
Actinium 228	0.359		0.141	0.145		0.129	pCi/g	12/03/20 14:31	12/30/20 08:03	1
Actinium-227	0.118	U	0.312	0.313		0.345	pCi/g	12/03/20 14:31	12/30/20 08:03	1
Bismuth-212	-0.314	U	0.761	0.762		0.597	pCi/g	12/03/20 14:31	12/30/20 08:03	1
<b>Bismuth-214</b>	<b>0.302</b>		0.101	0.106		0.0413	pCi/g	12/03/20 14:31	12/30/20 08:03	1
Cesium-137	-0.00359	U	0.0492	0.0492	0.0700	0.0401	pCi/g	12/03/20 14:31	12/30/20 08:03	1
Lead-210	-0.590	U	1.30	1.30		1.09	pCi/g	12/03/20 14:31	12/30/20 08:03	1
<b>Lead-212</b>	<b>0.206</b>		0.0991	0.103		0.0510	pCi/g	12/03/20 14:31	12/30/20 08:03	1
Lead-214	0.182		0.0948	0.0966		0.101	pCi/g	12/03/20 14:31	12/30/20 08:03	1
<b>Potassium-40</b>	<b>6.39</b>		1.24	1.40		0.243	pCi/g	12/03/20 14:31	12/30/20 08:03	1
Protactinium-231	0.393	U	1.36	1.36		1.50	pCi/g	12/03/20 14:31	12/30/20 08:03	1
Protactinium-234	-0.106	U	0.282	0.282		0.229	pCi/g	12/03/20 14:31	12/30/20 08:03	1
Radium-226	0.302		0.101	0.106	0.200	0.0413	pCi/g	12/03/20 14:31	12/30/20 08:03	1
<b>Radium-228</b>	<b>0.359</b>		0.141	0.145		0.129	pCi/g	12/03/20 14:31	12/30/20 08:03	1
<b>Thallium-208</b>	<b>0.128</b>		0.0500	0.0517		0.0198	pCi/g	12/03/20 14:31	12/30/20 08:03	1
<b>Thorium 228</b>	<b>0.206</b>		0.0991	0.103		0.0510	pCi/g	12/03/20 14:31	12/30/20 08:03	1
Thorium-232	0.359		0.141	0.145		0.129	pCi/g	12/03/20 14:31	12/30/20 08:03	1
<b>Thorium-234</b>	<b>0.571</b>		0.625	0.629		0.359	pCi/g	12/03/20 14:31	12/30/20 08:03	1
Uranium-235	0.0701	U	0.206	0.206		0.417	pCi/g	12/03/20 14:31	12/30/20 08:03	1
Uranium-238	0.571		0.625	0.629		0.359	pCi/g	12/03/20 14:31	12/30/20 08:03	1

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# Client Sample Results

Page 44 of 72

Client: Aptim Federal Services LLC  
Project/Site: HPNS-Parcel G 501197

Job ID: 160-40596-1  
SDG: GJ46599740

**Client Sample ID: HPPG-ESU-TU107B-017**

**Lab Sample ID: 160-40596-17**

Date Collected: 11/24/20 15:45

Matrix: Solid

Date Received: 11/27/20 09:12

## Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac	
			(2σ+/-)	(2σ+/-)							
Actinium 228	0.215		0.230	0.231		0.132	pCi/g	12/03/20 14:31	12/30/20 08:18	1	
Actinium-227	0.226	U	0.458	0.459		0.273	pCi/g	12/03/20 14:31	12/30/20 08:18	1	
Bismuth-212	0.987		0.632	0.640		0.280	pCi/g	12/03/20 14:31	12/30/20 08:18	1	
Bismuth-214	0.411		0.112	0.120		0.0457	pCi/g	12/03/20 14:31	12/30/20 08:18	1	
Cesium-137	-0.0214	U	0.0688	0.0689	0.0700	0.0551	pCi/g	12/03/20 14:31	12/30/20 08:18	1	
Lead-210	0.670	U		1.43	1.43		1.14	pCi/g	12/03/20 14:31	12/30/20 08:18	1
Lead-212	0.372		0.0905	0.103		0.0501	pCi/g	12/03/20 14:31	12/30/20 08:18	1	
Lead-214	0.446		0.130	0.138		0.0543	pCi/g	12/03/20 14:31	12/30/20 08:18	1	
Potassium-40	7.84			1.24	1.48		0.253	pCi/g	12/03/20 14:31	12/30/20 08:18	1
Protactinium-231	-0.811	U		3.05	3.05		2.49	pCi/g	12/03/20 14:31	12/30/20 08:18	1
Protactinium-234	0.0778	U		0.285	0.285		0.232	pCi/g	12/03/20 14:31	12/30/20 08:18	1
Radium-226	0.411		0.112	0.120	0.200	0.0457	pCi/g	12/03/20 14:31	12/30/20 08:18	1	
Radium-228	0.215		0.230	0.231		0.132	pCi/g	12/03/20 14:31	12/30/20 08:18	1	
Thallium-208	0.155		0.0579	0.0601		0.0235	pCi/g	12/03/20 14:31	12/30/20 08:18	1	
Thorium 228	0.372		0.0905	0.103		0.0501	pCi/g	12/03/20 14:31	12/30/20 08:18	1	
Thorium-232	0.215		0.230	0.231		0.132	pCi/g	12/03/20 14:31	12/30/20 08:18	1	
Thorium-234	0.566		0.468	0.473		0.412	pCi/g	12/03/20 14:31	12/30/20 08:18	1	
Uranium-235	-0.170	U		0.539	0.539		0.440	pCi/g	12/03/20 14:31	12/30/20 08:18	1
Uranium-238	0.566		0.468	0.473		0.412	pCi/g	12/03/20 14:31	12/30/20 08:18	1	

**Client Sample ID: HPPG-ESU-TU107B-018**

**Lab Sample ID: 160-40596-18**

Date Collected: 11/24/20 15:47

Matrix: Solid

Date Received: 11/27/20 09:12

## Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			(2σ+/-)	(2σ+/-)						
Actinium 228	0.171		0.241	0.242		0.152	pCi/g	12/03/20 14:31	12/30/20 08:17	1
Actinium-227	0.139	U	0.475	0.475		0.289	pCi/g	12/03/20 14:31	12/30/20 08:17	1
Bismuth-212	0.221	U	0.441	0.442		0.327	pCi/g	12/03/20 14:31	12/30/20 08:17	1
Bismuth-214	0.362		0.123	0.130		0.0517	pCi/g	12/03/20 14:31	12/30/20 08:17	1
Cesium-137	0.0176	U	0.0401	0.0402	0.0700	0.0304	pCi/g	12/03/20 14:31	12/30/20 08:17	1
Lead-210	1.13		1.35	1.36		0.890	pCi/g	12/03/20 14:31	12/30/20 08:17	1
Lead-212	0.294		0.0833	0.0902		0.0468	pCi/g	12/03/20 14:31	12/30/20 08:17	1
Lead-214	0.319		0.0975	0.104		0.0500	pCi/g	12/03/20 14:31	12/30/20 08:17	1
Potassium-40	5.24		1.57	1.68		0.624	pCi/g	12/03/20 14:31	12/30/20 08:17	1
Protactinium-231	0.413	U	1.62	1.62		2.00	pCi/g	12/03/20 14:31	12/30/20 08:17	1
Protactinium-234	-0.0377	U	0.0857	0.0859		0.275	pCi/g	12/03/20 14:31	12/30/20 08:17	1
Radium-226	0.362		0.123	0.130	0.200	0.0517	pCi/g	12/03/20 14:31	12/30/20 08:17	1
Radium-228	0.171		0.241	0.242		0.152	pCi/g	12/03/20 14:31	12/30/20 08:17	1
Thallium-208	0.0950		0.0715	0.0723		0.0308	pCi/g	12/03/20 14:31	12/30/20 08:17	1
Thorium 228	0.294		0.0833	0.0902		0.0468	pCi/g	12/03/20 14:31	12/30/20 08:17	1
Thorium-232	0.171		0.241	0.242		0.152	pCi/g	12/03/20 14:31	12/30/20 08:17	1
Thorium-234	0.471		0.573	0.576		0.369	pCi/g	12/03/20 14:31	12/30/20 08:17	1
Uranium-235	0.194	U	0.197	0.199		0.401	pCi/g	12/03/20 14:31	12/30/20 08:17	1
Uranium-238	0.471		0.573	0.576		0.369	pCi/g	12/03/20 14:31	12/30/20 08:17	1

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# Client Sample Results

Page 45 of 72

Client: Aptim Federal Services LLC  
Project/Site: HPNS-Parcel G 501197

Job ID: 160-40596-1  
SDG: GJ46599740

**Client Sample ID: HPPG-ESU-TU107B-019**

**Lab Sample ID: 160-40596-19**

Date Collected: 11/24/20 15:48

Matrix: Solid

Date Received: 11/27/20 09:12

## Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			(2σ+/-)	(2σ+/-)						
Actinium 228	0.124	U	0.226	0.227		0.189	pCi/g	12/04/20 14:01	12/25/20 09:10	1
Actinium-227	0.0275	U	0.556	0.556		0.345	pCi/g	12/04/20 14:01	12/25/20 09:10	1
Bismuth-212	0.000	U	0.511	0.511		0.626	pCi/g	12/04/20 14:01	12/25/20 09:10	1
<b>Bismuth-214</b>	<b>0.358</b>		0.111	0.118		0.0417	pCi/g	12/04/20 14:01	12/25/20 09:10	1
Cesium-137	0.0403	U	0.0737	0.0739	0.0700	0.0570	pCi/g	12/04/20 14:01	12/25/20 09:10	1
<b>Lead-210</b>	<b>1.79</b>		1.76	1.78		1.07	pCi/g	12/04/20 14:01	12/25/20 09:10	1
<b>Lead-212</b>	<b>0.335</b>		0.0895	0.0978		0.0465	pCi/g	12/04/20 14:01	12/25/20 09:10	1
Lead-214	0.0937	U	0.0837	0.0844		0.122	pCi/g	12/04/20 14:01	12/25/20 09:10	1
<b>Potassium-40</b>	<b>8.46</b>		1.45	1.75		0.306	pCi/g	12/04/20 14:01	12/25/20 09:10	1
Protactinium-231	-0.353	U	3.00	3.00		2.46	pCi/g	12/04/20 14:01	12/25/20 09:10	1
Protactinium-234	0.0665	U	0.125	0.125		0.292	pCi/g	12/04/20 14:01	12/25/20 09:10	1
<b>Radium-226</b>	<b>0.358</b>		0.111	0.118	0.200	0.0417	pCi/g	12/04/20 14:01	12/25/20 09:10	1
Radium-228	0.124	U	0.226	0.227		0.189	pCi/g	12/04/20 14:01	12/25/20 09:10	1
<b>Thallium-208</b>	<b>0.137</b>		0.0608	0.0628		0.0246	pCi/g	12/04/20 14:01	12/25/20 09:10	1
<b>Thorium 228</b>	<b>0.335</b>		0.0895	0.0978		0.0465	pCi/g	12/04/20 14:01	12/25/20 09:10	1
Thorium-232	0.124	U	0.226	0.227		0.189	pCi/g	12/04/20 14:01	12/25/20 09:10	1
<b>Thorium-234</b>	<b>0.593</b>		0.557	0.562		0.457	pCi/g	12/04/20 14:01	12/25/20 09:10	1
Uranium-235	0.168	U	0.596	0.597		0.486	pCi/g	12/04/20 14:01	12/25/20 09:10	1
Uranium-238	0.593		0.557	0.562		0.457	pCi/g	12/04/20 14:01	12/25/20 09:10	1

**Client Sample ID: HPPG-ESU-TU107B-020**

**Lab Sample ID: 160-40596-20**

Date Collected: 11/24/20 15:51

Matrix: Solid

Date Received: 11/27/20 09:12

## Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			(2σ+/-)	(2σ+/-)						
Actinium 228	0.290		0.190	0.192		0.110	pCi/g	12/04/20 14:01	12/25/20 09:29	1
Actinium-227	0.148	U	0.448	0.448		0.303	pCi/g	12/04/20 14:01	12/25/20 09:29	1
Bismuth-212	-0.0244	U	0.754	0.754		0.619	pCi/g	12/04/20 14:01	12/25/20 09:29	1
<b>Bismuth-214</b>	<b>0.341</b>		0.123	0.128		0.0528	pCi/g	12/04/20 14:01	12/25/20 09:29	1
Cesium-137	-0.0132	U	0.0899	0.0899	0.0700	0.0731	pCi/g	12/04/20 14:01	12/25/20 09:29	1
<b>Lead-210</b>	<b>1.41</b>		1.53	1.54		0.976	pCi/g	12/04/20 14:01	12/25/20 09:29	1
<b>Lead-212</b>	<b>0.430</b>		0.0884	0.0991		0.0405	pCi/g	12/04/20 14:01	12/25/20 09:29	1
Lead-214	0.376		0.107	0.114		0.0468	pCi/g	12/04/20 14:01	12/25/20 09:29	1
<b>Potassium-40</b>	<b>8.00</b>		1.45	1.66		0.218	pCi/g	12/04/20 14:01	12/25/20 09:29	1
Protactinium-231	0.641	U	1.95	1.96		2.14	pCi/g	12/04/20 14:01	12/25/20 09:29	1
Protactinium-234	0.108	U	0.160	0.160		0.224	pCi/g	12/04/20 14:01	12/25/20 09:29	1
<b>Radium-226</b>	<b>0.341</b>		0.123	0.128	0.200	0.0528	pCi/g	12/04/20 14:01	12/25/20 09:29	1
Radium-228	0.290		0.190	0.192		0.110	pCi/g	12/04/20 14:01	12/25/20 09:29	1
<b>Thallium-208</b>	<b>0.0764</b>		0.103	0.103		0.0525	pCi/g	12/04/20 14:01	12/25/20 09:29	1
<b>Thorium 228</b>	<b>0.430</b>		0.0884	0.0991		0.0405	pCi/g	12/04/20 14:01	12/25/20 09:29	1
Thorium-232	0.290		0.190	0.192		0.110	pCi/g	12/04/20 14:01	12/25/20 09:29	1
<b>Thorium-234</b>	<b>0.547</b>		0.433	0.437		0.404	pCi/g	12/04/20 14:01	12/25/20 09:29	1
Uranium-235	-0.204	U	0.276	0.277		0.413	pCi/g	12/04/20 14:01	12/25/20 09:29	1
Uranium-238	0.547		0.433	0.437		0.404	pCi/g	12/04/20 14:01	12/25/20 09:29	1

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# Client Sample Results

Page 46 of 72

Client: Aptim Federal Services LLC  
Project/Site: HPNS-Parcel G 501197

Job ID: 160-40596-1  
SDG: GJ46599740

**Client Sample ID: HPPG-ESU-TU107B-021**

**Lab Sample ID: 160-40596-21**

Date Collected: 11/24/20 15:52

Matrix: Solid

Date Received: 11/27/20 09:12

## Method: 905 - Strontium-90 (GFPC)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			Uncert. (2σ+/-)	Uncert. (2σ+/-)						
Strontium-90	0.0433	U	0.152	0.152	0.331	0.122	pCi/g	12/09/20 18:42	12/18/20 20:14	1
<b>Carrier</b>	<b>%Yield</b>	<b>Qualifier</b>	<b>Limits</b>					<b>Prepared</b>	<b>Analyzed</b>	<b>Dil Fac</b>
Sr Carrier	96.7		40 - 110					12/09/20 18:42	12/18/20 20:14	1
Y Carrier	91.2		40 - 110					12/09/20 18:42	12/18/20 20:14	1

## Method: A-01-R - Isotopic Thorium (Alpha Spectrometry)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			Uncert. (2σ+/-)	Uncert. (2σ+/-)						
Thorium-228	1.16		0.107	0.145	0.250	0.0271	pCi/g	12/15/20 14:37	12/30/20 10:45	1
Thorium-230	0.572		0.0863	0.0988	0.250	0.0337	pCi/g	12/15/20 14:37	12/30/20 10:45	1
Thorium-232	1.25		0.105	0.149	0.250	0.0138	pCi/g	12/15/20 14:37	12/30/20 10:45	1
<b>Tracer</b>	<b>%Yield</b>	<b>Qualifier</b>	<b>Limits</b>					<b>Prepared</b>	<b>Analyzed</b>	<b>Dil Fac</b>
Thorium-229	80.6		30 - 110					12/15/20 14:37	12/30/20 10:45	1

## Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			Uncert. (2σ+/-)	Uncert. (2σ+/-)						
Actinium 228	0.364		0.214	0.217		0.0819	pCi/g	12/04/20 14:01	12/25/20 09:29	1
Actinium-227	0.0156	U	0.476	0.476		0.295	pCi/g	12/04/20 14:01	12/25/20 09:29	1
Bismuth-212	0.252	U	0.738	0.738		0.577	pCi/g	12/04/20 14:01	12/25/20 09:29	1
<b>Bismuth-214</b>	<b>0.211</b>		0.124	0.125		0.0751	pCi/g	12/04/20 14:01	12/25/20 09:29	1
Cesium-137	0.0103	U	0.0611	0.0611	0.0700	0.0489	pCi/g	12/04/20 14:01	12/25/20 09:29	1
Lead-210	-1.33	U	0.867	0.881		1.12	pCi/g	12/04/20 14:01	12/25/20 09:29	1
<b>Lead-212</b>	<b>0.293</b>		0.0852	0.0933		0.0455	pCi/g	12/04/20 14:01	12/25/20 09:29	1
<b>Lead-214</b>	<b>0.322</b>		0.0978	0.103		0.0651	pCi/g	12/04/20 14:01	12/25/20 09:29	1
Potassium-40	5.56		1.59	1.69		0.564	pCi/g	12/04/20 14:01	12/25/20 09:29	1
Protactinium-231	-0.669	U	2.45	2.45		1.99	pCi/g	12/04/20 14:01	12/25/20 09:29	1
Protactinium-234	-0.0925	U	0.238	0.239		0.193	pCi/g	12/04/20 14:01	12/25/20 09:29	1
Radium-226	0.211		0.124	0.125	0.200	0.0751	pCi/g	12/04/20 14:01	12/25/20 09:29	1
Radium-228	0.364		0.214	0.217		0.0819	pCi/g	12/04/20 14:01	12/25/20 09:29	1
Thallium-208	0.138		0.0659	0.0675		0.0342	pCi/g	12/04/20 14:01	12/25/20 09:29	1
Thorium 228	0.293		0.0852	0.0933		0.0455	pCi/g	12/04/20 14:01	12/25/20 09:29	1
<b>Thorium-232</b>	<b>0.364</b>		0.214	0.217		0.0819	pCi/g	12/04/20 14:01	12/25/20 09:29	1
Thorium-234	0.176	U	0.265	0.266		0.672	pCi/g	12/04/20 14:01	12/25/20 09:29	1
Uranium-235	0.116	U	0.222	0.222		0.176	pCi/g	12/04/20 14:01	12/25/20 09:29	1
Uranium-238	0.176	U	0.265	0.266		0.672	pCi/g	12/04/20 14:01	12/25/20 09:29	1

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# Client Sample Results

Page 47 of 72

Client: Aptim Federal Services LLC  
Project/Site: HPNS-Parcel G 501197

Job ID: 160-40596-1  
SDG: GJ46599740

**Client Sample ID: HPPG-ESU-TU107B-022**

**Lab Sample ID: 160-40596-22**

Date Collected: 11/24/20 15:53

Matrix: Solid

Date Received: 11/27/20 09:12

## Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			(2σ+/-)	(2σ+/-)						
Actinium 228	0.304		0.115	0.119		0.0236	pCi/g	12/04/20 14:01	12/25/20 09:48	1
Actinium-227	-0.298	U	0.469	0.471		0.360	pCi/g	12/04/20 14:01	12/25/20 09:48	1
Bismuth-212	-0.234	U	0.368	0.369		0.530	pCi/g	12/04/20 14:01	12/25/20 09:48	1
Bismuth-214	0.0537	U	0.157	0.157		0.130	pCi/g	12/04/20 14:01	12/25/20 09:48	1
Cesium-137	0.00948	U	0.0482	0.0482	0.0700	0.0269	pCi/g	12/04/20 14:01	12/25/20 09:48	1
Lead-210	1.03		1.07	1.07		0.677	pCi/g	12/04/20 14:01	12/25/20 09:48	1
Lead-212	0.306		0.0720	0.0821		0.0366	pCi/g	12/04/20 14:01	12/25/20 09:48	1
Lead-214	0.327		0.0852	0.0917		0.0347	pCi/g	12/04/20 14:01	12/25/20 09:48	1
Potassium-40	6.35		1.05	1.24		0.255	pCi/g	12/04/20 14:01	12/25/20 09:48	1
Protactinium-231	0.000	U	0.259	0.259		1.89	pCi/g	12/04/20 14:01	12/25/20 09:48	1
Protactinium-234	-0.0135	U	0.0257	0.0257		0.137	pCi/g	12/04/20 14:01	12/25/20 09:48	1
Radium-226	0.0537	U	0.157	0.157	0.200	0.130	pCi/g	12/04/20 14:01	12/25/20 09:48	1
Radium-228	0.304		0.115	0.119		0.0236	pCi/g	12/04/20 14:01	12/25/20 09:48	1
Thallium-208	0.124		0.0484	0.0501		0.0201	pCi/g	12/04/20 14:01	12/25/20 09:48	1
Thorium 228	0.306		0.0720	0.0821		0.0366	pCi/g	12/04/20 14:01	12/25/20 09:48	1
Thorium-232	0.304		0.115	0.119		0.0236	pCi/g	12/04/20 14:01	12/25/20 09:48	1
Thorium-234	-0.532	U	0.801	0.803		0.642	pCi/g	12/04/20 14:01	12/25/20 09:48	1
Uranium-235	0.000	U	0.185	0.185		0.227	pCi/g	12/04/20 14:01	12/25/20 09:48	1
Uranium-238	-0.532	U	0.801	0.803		0.642	pCi/g	12/04/20 14:01	12/25/20 09:48	1

**Client Sample ID: HPPG-ESU-TU107B-023**

**Lab Sample ID: 160-40596-23**

Date Collected: 11/24/20 15:55

Matrix: Solid

Date Received: 11/27/20 09:12

## Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			(2σ+/-)	(2σ+/-)						
Actinium 228	0.232		0.151	0.153		0.0785	pCi/g	12/04/20 14:01	12/25/20 09:47	1
Actinium-227	0.185	U	0.371	0.372		0.212	pCi/g	12/04/20 14:01	12/25/20 09:47	1
Bismuth-212	-0.0262	U	0.494	0.494		0.323	pCi/g	12/04/20 14:01	12/25/20 09:47	1
<b>Bismuth-214</b>	<b>0.293</b>		0.0986	0.103		0.0424	pCi/g	12/04/20 14:01	12/25/20 09:47	1
Cesium-137	0.0125	U	0.0301	0.0301	0.0700	0.0231	pCi/g	12/04/20 14:01	12/25/20 09:47	1
Lead-210	0.359	U	0.931	0.932		0.746	pCi/g	12/04/20 14:01	12/25/20 09:47	1
<b>Lead-212</b>	<b>0.312</b>		0.0598	0.0721		0.0232	pCi/g	12/04/20 14:01	12/25/20 09:47	1
<b>Lead-214</b>	<b>0.268</b>		0.0726	0.0778		0.0413	pCi/g	12/04/20 14:01	12/25/20 09:47	1
<b>Potassium-40</b>	<b>6.54</b>		0.990	1.19		0.227	pCi/g	12/04/20 14:01	12/25/20 09:47	1
Protactinium-231	-0.0000001	U	1.84	1.84		1.52	pCi/g	12/04/20 14:01	12/25/20 09:47	1
		68								
Protactinium-234	0.0572	U	0.172	0.173		0.140	pCi/g	12/04/20 14:01	12/25/20 09:47	1
<b>Radium-226</b>	<b>0.293</b>		0.0986	0.103	0.200	0.0424	pCi/g	12/04/20 14:01	12/25/20 09:47	1
<b>Radium-228</b>	<b>0.232</b>		0.151	0.153		0.0785	pCi/g	12/04/20 14:01	12/25/20 09:47	1
Thallium-208	0.0793		0.0444	0.0452		0.0209	pCi/g	12/04/20 14:01	12/25/20 09:47	1
<b>Thorium 228</b>	<b>0.312</b>		0.0598	0.0721		0.0232	pCi/g	12/04/20 14:01	12/25/20 09:47	1
<b>Thorium-232</b>	<b>0.232</b>		0.151	0.153		0.0785	pCi/g	12/04/20 14:01	12/25/20 09:47	1
Thorium-234	-0.230	U	0.726	0.726		0.592	pCi/g	12/04/20 14:01	12/25/20 09:47	1
Uranium-235	-0.125	U	0.212	0.212		0.168	pCi/g	12/04/20 14:01	12/25/20 09:47	1
Uranium-238	-0.230	U	0.726	0.726		0.592	pCi/g	12/04/20 14:01	12/25/20 09:47	1

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# Client Sample Results

Page 48 of 72

Client: Aptim Federal Services LLC  
Project/Site: HPNS-Parcel G 501197

Job ID: 160-40596-1  
SDG: GJ46599740

**Client Sample ID: HPPG-ESU-TU107B-024**

**Lab Sample ID: 160-40596-24**

Date Collected: 11/24/20 15:57

Matrix: Solid

Date Received: 11/27/20 09:12

## Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			(2σ+/-)	(2σ+/-)						
Actinium-228	0.466		0.159	0.166		0.0601	pCi/g	12/04/20 14:01	12/25/20 09:49	1
Actinium-227	0.0403	U	0.112	0.112		0.287	pCi/g	12/04/20 14:01	12/25/20 09:49	1
Bismuth-212	-0.527	U	0.864	0.866		0.673	pCi/g	12/04/20 14:01	12/25/20 09:49	1
<b>Bismuth-214</b>	<b>0.307</b>		0.108	0.112		0.0477	pCi/g	12/04/20 14:01	12/25/20 09:49	1
Cesium-137	0.0187	U	0.0440	0.0440	0.0700	0.0340	pCi/g	12/04/20 14:01	12/25/20 09:49	1
Lead-210	0.591	U	1.04	1.04		0.747	pCi/g	12/04/20 14:01	12/25/20 09:49	1
<b>Lead-212</b>	<b>0.287</b>		0.0753	0.0810		0.0396	pCi/g	12/04/20 14:01	12/25/20 09:49	1
<b>Lead-214</b>	<b>0.298</b>		0.101	0.106		0.0460	pCi/g	12/04/20 14:01	12/25/20 09:49	1
<b>Potassium-40</b>	<b>7.51</b>		1.16	1.38		0.104	pCi/g	12/04/20 14:01	12/25/20 09:49	1
Protactinium-231	0.0000000	U	2.22	2.22		1.83	pCi/g	12/04/20 14:01	12/25/20 09:49	1
244										
Protactinium-234	-0.0923	U	0.280	0.280		0.228	pCi/g	12/04/20 14:01	12/25/20 09:49	1
<b>Radium-226</b>	<b>0.307</b>		0.108	0.112	0.200	0.0477	pCi/g	12/04/20 14:01	12/25/20 09:49	1
<b>Radium-228</b>	<b>0.466</b>		0.159	0.166		0.0601	pCi/g	12/04/20 14:01	12/25/20 09:49	1
Thallium-208	0.102		0.0455	0.0467		0.0159	pCi/g	12/04/20 14:01	12/25/20 09:49	1
<b>Thorium 228</b>	<b>0.287</b>		0.0753	0.0810		0.0396	pCi/g	12/04/20 14:01	12/25/20 09:49	1
<b>Thorium-232</b>	<b>0.466</b>		0.159	0.166		0.0601	pCi/g	12/04/20 14:01	12/25/20 09:49	1
<b>Thorium-234</b>	<b>0.524</b>		0.579	0.582		0.380	pCi/g	12/04/20 14:01	12/25/20 09:49	1
Uranium-235	0.0631	U	0.199	0.199		0.420	pCi/g	12/04/20 14:01	12/25/20 09:49	1
Uranium-238	0.524		0.579	0.582		0.380	pCi/g	12/04/20 14:01	12/25/20 09:49	1

**Client Sample ID: HPPG-ESU-TU107B-025**

**Lab Sample ID: 160-40596-25**

Date Collected: 11/24/20 16:01

Matrix: Solid

Date Received: 11/27/20 09:12

## Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			(2σ+/-)	(2σ+/-)						
Actinium-228	0.318		0.221	0.224		0.103	pCi/g	12/04/20 14:01	12/25/20 09:51	1
Actinium-227	-0.0869	U	0.499	0.499		0.294	pCi/g	12/04/20 14:01	12/25/20 09:51	1
Bismuth-212	0.228	U	0.390	0.391		0.292	pCi/g	12/04/20 14:01	12/25/20 09:51	1
<b>Bismuth-214</b>	<b>0.355</b>		0.108	0.114		0.0460	pCi/g	12/04/20 14:01	12/25/20 09:51	1
Cesium-137	-0.0149	U	0.0539	0.0539	0.0700	0.0433	pCi/g	12/04/20 14:01	12/25/20 09:51	1
Lead-210	-0.651	U	1.41	1.41		1.13	pCi/g	12/04/20 14:01	12/25/20 09:51	1
<b>Lead-212</b>	<b>0.423</b>		0.0719	0.0904		0.0305	pCi/g	12/04/20 14:01	12/25/20 09:51	1
<b>Lead-214</b>	<b>0.251</b>		0.0733	0.0778		0.0437	pCi/g	12/04/20 14:01	12/25/20 09:51	1
<b>Potassium-40</b>	<b>7.53</b>		1.02	1.28		0.0812	pCi/g	12/04/20 14:01	12/25/20 09:51	1
Protactinium-231	-0.689	U	2.11	2.11		1.71	pCi/g	12/04/20 14:01	12/25/20 09:51	1
Protactinium-234	0.0309	U	0.214	0.214		0.175	pCi/g	12/04/20 14:01	12/25/20 09:51	1
<b>Radium-226</b>	<b>0.355</b>		0.108	0.114	0.200	0.0460	pCi/g	12/04/20 14:01	12/25/20 09:51	1
<b>Radium-228</b>	<b>0.318</b>		0.221	0.224		0.103	pCi/g	12/04/20 14:01	12/25/20 09:51	1
Thallium-208	0.130		0.0408	0.0430		0.0142	pCi/g	12/04/20 14:01	12/25/20 09:51	1
<b>Thorium 228</b>	<b>0.423</b>		0.0719	0.0904		0.0305	pCi/g	12/04/20 14:01	12/25/20 09:51	1
<b>Thorium-232</b>	<b>0.318</b>		0.221	0.224		0.103	pCi/g	12/04/20 14:01	12/25/20 09:51	1
Thorium-234	0.0243	U	0.0472	0.0473		0.783	pCi/g	12/04/20 14:01	12/25/20 09:51	1
Uranium-235	0.000	U	0.159	0.159		0.300	pCi/g	12/04/20 14:01	12/25/20 09:51	1
Uranium-238	0.0243	U	0.0472	0.0473		0.783	pCi/g	12/04/20 14:01	12/25/20 09:51	1

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# Client Sample Results

Client: Aptim Federal Services LLC  
Project/Site: HPNS-Parcel G 501197

Page 49 of 72

Job ID: 160-40596-1  
SDG: GJ46599740

**Client Sample ID: HPPG-F-049**

Date Collected: 11/24/20 15:26  
Date Received: 11/27/20 09:12

**Lab Sample ID: 160-40596-26**

Matrix: Solid

## Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			(2σ+/-)	(2σ+/-)						
Actinium 228	0.431		0.246	0.250		0.103	pCi/g	12/04/20 14:01	12/25/20 10:16	1
Actinium-227	0.136	U	0.325	0.325		0.258	pCi/g	12/04/20 14:01	12/25/20 10:16	1
Bismuth-212	-0.0307	U	0.823	0.823		0.675	pCi/g	12/04/20 14:01	12/25/20 10:16	1
<b>Bismuth-214</b>	<b>0.292</b>		0.129	0.132		0.0594	pCi/g	12/04/20 14:01	12/25/20 10:16	1
Cesium-137	0.0138	U	0.0656	0.0657	0.0700	0.0528	pCi/g	12/04/20 14:01	12/25/20 10:16	1
<b>Lead-210</b>	<b>1.01</b>		1.31	1.31		0.887	pCi/g	12/04/20 14:01	12/25/20 10:16	1
<b>Lead-212</b>	<b>0.479</b>		0.0879	0.101		0.0376	pCi/g	12/04/20 14:01	12/25/20 10:16	1
<b>Lead-214</b>	<b>0.518</b>		0.104	0.117		0.0403	pCi/g	12/04/20 14:01	12/25/20 10:16	1
<b>Potassium-40</b>	<b>8.96</b>		1.49	1.74		0.205	pCi/g	12/04/20 14:01	12/25/20 10:16	1
Protactinium-231	-0.284	U	2.60	2.60		2.13	pCi/g	12/04/20 14:01	12/25/20 10:16	1
Protactinium-234	0.0391	U	0.0736	0.0737		0.207	pCi/g	12/04/20 14:01	12/25/20 10:16	1
Radium-226	0.292		0.129	0.132	0.200	0.0594	pCi/g	12/04/20 14:01	12/25/20 10:16	1
Radium-228	0.431		0.246	0.250		0.103	pCi/g	12/04/20 14:01	12/25/20 10:16	1
Thallium-208	0.172		0.0561	0.0588		0.0144	pCi/g	12/04/20 14:01	12/25/20 10:16	1
Thorium 228	0.479		0.0879	0.101		0.0376	pCi/g	12/04/20 14:01	12/25/20 10:16	1
Thorium-232	0.431		0.246	0.250		0.103	pCi/g	12/04/20 14:01	12/25/20 10:16	1
Thorium-234	0.701		0.548	0.553		0.350	pCi/g	12/04/20 14:01	12/25/20 10:16	1
Uranium-235	0.0652	U	0.145	0.145		0.360	pCi/g	12/04/20 14:01	12/25/20 10:16	1
Uranium-238	0.701		0.548	0.553		0.350	pCi/g	12/04/20 14:01	12/25/20 10:16	1

**Client Sample ID: HPPG-F-050**

Date Collected: 11/24/20 15:44  
Date Received: 11/27/20 09:12

**Lab Sample ID: 160-40596-27**

Matrix: Solid

## Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			(2σ+/-)	(2σ+/-)						
Actinium 228	0.159		0.0960	0.0974		0.0360	pCi/g	12/04/20 14:01	12/25/20 10:15	1
Actinium-227	0.102	U	0.352	0.352		0.262	pCi/g	12/04/20 14:01	12/25/20 10:15	1
Bismuth-212	0.239	U	0.626	0.627		0.483	pCi/g	12/04/20 14:01	12/25/20 10:15	1
<b>Bismuth-214</b>	<b>0.282</b>		0.114	0.118		0.0632	pCi/g	12/04/20 14:01	12/25/20 10:15	1
Cesium-137	0.00322	U	0.0552	0.0552	0.0700	0.0341	pCi/g	12/04/20 14:01	12/25/20 10:15	1
<b>Lead-210</b>	<b>0.810</b>		0.863	0.868		0.580	pCi/g	12/04/20 14:01	12/25/20 10:15	1
<b>Lead-212</b>	<b>0.306</b>		0.0768	0.0864		0.0341	pCi/g	12/04/20 14:01	12/25/20 10:15	1
<b>Lead-214</b>	<b>0.137</b>		0.0928	0.0939		0.0875	pCi/g	12/04/20 14:01	12/25/20 10:15	1
<b>Potassium-40</b>	<b>6.82</b>		1.34	1.51		0.245	pCi/g	12/04/20 14:01	12/25/20 10:15	1
Protactinium-231	0.594	U	1.88	1.88		1.51	pCi/g	12/04/20 14:01	12/25/20 10:15	1
Protactinium-234	0.0196	U	0.0506	0.0506		0.163	pCi/g	12/04/20 14:01	12/25/20 10:15	1
Radium-226	0.282		0.114	0.118	0.200	0.0632	pCi/g	12/04/20 14:01	12/25/20 10:15	1
Radium-228	0.159		0.0960	0.0974		0.0360	pCi/g	12/04/20 14:01	12/25/20 10:15	1
Thallium-208	0.124		0.0569	0.0583		0.0210	pCi/g	12/04/20 14:01	12/25/20 10:15	1
Thorium 228	0.306		0.0768	0.0864		0.0341	pCi/g	12/04/20 14:01	12/25/20 10:15	1
Thorium-232	0.159		0.0960	0.0974		0.0360	pCi/g	12/04/20 14:01	12/25/20 10:15	1
Thorium-234	0.455		0.425	0.428		0.287	pCi/g	12/04/20 14:01	12/25/20 10:15	1
Uranium-235	-0.0659	U	0.0576	0.0579		0.172	pCi/g	12/04/20 14:01	12/25/20 10:15	1
Uranium-238	0.455		0.425	0.428		0.287	pCi/g	12/04/20 14:01	12/25/20 10:15	1

Eurofins TestAmerica, St. Louis

# QC Sample Results

Client: Aptim Federal Services LLC  
Project/Site: HPNS-Parcel G 501197

Page 50 of 72

Job ID: 160-40596-1  
SDG: GJ46599740

## Method: 905 - Strontium-90 (GFPC)

Lab Sample ID: MB 160-491323/23-A

Matrix: Solid

Analysis Batch: 492430

Client Sample ID: Method Blank

Prep Type: Total/NA

Prep Batch: 491323

Analyte	MB MB		Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
	Result	Qualifier								
Strontium-90	0.07392	U	0.140	0.140	0.331	0.108	pCi/g	12/09/20 18:42	12/18/20 20:20	1
<b>Carrier</b>										
Sr Carrier										
Y Carrier										

Lab Sample ID: LCS 160-491323/1-A

Matrix: Solid

Analysis Batch: 492430

Client Sample ID: Lab Control Sample

Prep Type: Total/NA

Prep Batch: 491323

Analyte	Spike		LCS Result	LCS Qual	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	%Rec	%Rec. Limits
	Added									
Strontium-90	7.76		5.897		0.638	0.331	0.109	pCi/g	76	75 - 125
<b>Carrier</b>										
Sr Carrier										
Y Carrier										

## Method: A-01-R - Isotopic Thorium (Alpha Spectrometry)

Lab Sample ID: MB 160-491944/1-A

Matrix: Solid

Analysis Batch: 493574

Client Sample ID: Method Blank

Prep Type: Total/NA

Prep Batch: 491944

Analyte	MB MB		Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
	Result	Qualifier								
Thorium-228	-0.03528	U	0.0205	0.0207	0.250	0.0163	pCi/g	12/15/20 14:37	12/30/20 10:45	1
Thorium-230	-0.06446	U	0.0317	0.0321	0.250	0.0228	pCi/g	12/15/20 14:37	12/30/20 10:45	1
Thorium-232	-0.003259	U	0.00917	0.00917	0.250	0.00754	pCi/g	12/15/20 14:37	12/30/20 10:45	1
<b>Tracer</b>										
Thorium-229										
93.0										
30 - 110										

Lab Sample ID: LCS 160-491944/2-A

Matrix: Solid

Analysis Batch: 493575

Client Sample ID: Lab Control Sample

Prep Type: Total/NA

Prep Batch: 491944

Analyte	Spike		LCS Result	LCS Qual	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	%Rec	%Rec. Limits
	Added									
Thorium-230	2.01		1.989		0.213	0.250	0.0233	pCi/g	99	81 - 118
<b>Tracer</b>										
Thorium-229										
89.9										
30 - 110										

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# QC Sample Results

Page 51 of 72

Client: Aptim Federal Services LLC  
Project/Site: HPNS-Parcel G 501197

Job ID: 160-40596-1  
SDG: GJ46599740

## Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Lab Sample ID: MB 160-490832/1-A

Matrix: Solid

Analysis Batch: 493377

Client Sample ID: Method Blank

Prep Type: Total/NA

Prep Batch: 490832

Analyte	MB	MB	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
	Result	Qualifier								
Actinium 228	-0.1405	U	0.389	0.389		0.204	pCi/g	12/03/20 14:31	12/30/20 06:31	1
Actinium-227	0.1060	U	0.233	0.233		0.213	pCi/g	12/03/20 14:31	12/30/20 06:31	1
Bismuth-212	-0.9069	U	1.30	1.31		1.31	pCi/g	12/03/20 14:31	12/30/20 06:31	1
Bismuth-214	-0.1124	U	0.195	0.195		0.169	pCi/g	12/03/20 14:31	12/30/20 06:31	1
Cesium-137	0.02373	U	0.106	0.106	0.0700	0.0844	pCi/g	12/03/20 14:31	12/30/20 06:31	1
Lead-210	0.8434		1.17	1.17		0.768	pCi/g	12/03/20 14:31	12/30/20 06:31	1
Lead-212	-0.001594	U	0.103	0.103		0.0849	pCi/g	12/03/20 14:31	12/30/20 06:31	1
Lead-214	-0.1533	U	0.189	0.190		0.137	pCi/g	12/03/20 14:31	12/30/20 06:31	1
Potassium-40	0.6779		0.685	0.689		0.372	pCi/g	12/03/20 14:31	12/30/20 06:31	1
Protactinium-231	-0.8332	U	2.34	2.34		1.87	pCi/g	12/03/20 14:31	12/30/20 06:31	1
Protactinium-234	0.05529	U	0.146	0.146		0.115	pCi/g	12/03/20 14:31	12/30/20 06:31	1
Radium-226	-0.1124	U	0.195	0.195	0.200	0.169	pCi/g	12/03/20 14:31	12/30/20 06:31	1
Radium-228	-0.1405	U	0.389	0.389		0.204	pCi/g	12/03/20 14:31	12/30/20 06:31	1
Thallium-208	0.005832	U	0.0140	0.0140		0.0330	pCi/g	12/03/20 14:31	12/30/20 06:31	1
Thorium 228	-0.001594	U	0.103	0.103		0.0849	pCi/g	12/03/20 14:31	12/30/20 06:31	1
Thorium-232	-0.1405	U	0.389	0.389		0.204	pCi/g	12/03/20 14:31	12/30/20 06:31	1
Thorium-234	-0.8414	U	0.454	0.464		0.723	pCi/g	12/03/20 14:31	12/30/20 06:31	1
Uranium-235	0.08293	U	0.251	0.251		0.219	pCi/g	12/03/20 14:31	12/30/20 06:31	1
Uranium-238	-0.8414	U	0.454	0.464		0.723	pCi/g	12/03/20 14:31	12/30/20 06:31	1

Lab Sample ID: LCS 160-490832/2-A

Matrix: Solid

Analysis Batch: 493376

Client Sample ID: Lab Control Sample

Prep Type: Total/NA

Prep Batch: 490832

Analyte	Spike	LCS	LCS	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	%Rec.	Limits
	Added	Result	Qual						
Americium-241	96.4	97.62		12.6		0.547	pCi/g	101	87 - 116
Cesium-137	26.7	29.90		3.56	0.0700	0.148	pCi/g	112	87 - 120
Cobalt-60	9.41	10.34		1.24		0.0533	pCi/g	110	87 - 115

Lab Sample ID: 160-40596-18 DU

Matrix: Solid

Analysis Batch: 493373

Client Sample ID: HPPG-ESU-TU107B-018

Prep Type: Total/NA

Prep Batch: 490832

Analyte	Sample	Sample	DU	DU	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	RER	Limit
	Result	Qual	Result	Qual						
Actinium 228	0.171		0.3435		0.142		0.0302	pCi/g	0.45	1
Actinium-227	0.139	U	0.08717	U	0.173		0.306	pCi/g	0.08	1
Bismuth-212	0.221	U	0.0000	U	0.323		0.544	pCi/g	0.29	1
Bismuth-214	0.362		0.3645		0.110		0.0381	pCi/g	0.01	1
Cesium-137	0.0176	U	0.02481	U	0.0625	0.0700	0.0493	pCi/g	0.07	1
Lead-210	1.13		-0.07716	U	1.25		1.03	pCi/g	0.46	1
Lead-212	0.294		0.2842		0.0902		0.0483	pCi/g	0.05	1
Lead-214	0.319		0.3183		0.112		0.0449	pCi/g	0	1
Potassium-40	5.24		5.476		1.60		0.551	pCi/g	0.07	1
Protactinium-231	0.413	U	0.0000	U	0.418		1.69	pCi/g	0.20	1
Protactinium-234	-0.0377	U	-0.00795	U	0.0162		0.198	pCi/g	0.29	1
			0							

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# QC Sample Results

Page 52 of 72

Client: Aptim Federal Services LLC  
Project/Site: HPNS-Parcel G 501197

Job ID: 160-40596-1  
SDG: GJ46599740

## Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS) (Continued)

Lab Sample ID: 160-40596-18 DU

Client Sample ID: HPPG-ESU-TU107B-018

Matrix: Solid

Analysis Batch: 493373

Prep Type: Total/NA

Prep Batch: 490832

Analyte	Sample	Sample	DU		Total		RER	Limit		
	Result	Qual	Result	Qual	Uncert. (2σ+/-)	LOQ	DLC	Unit		
Radium-226	0.362		0.3645		0.110	0.200	0.0381	pCi/g	0.01	1
Radium-228	0.171		0.3435		0.142		0.0302	pCi/g	0.45	1
Thallium-208	0.0950		0.04963		0.0839		0.0366	pCi/g	0.29	1
Thorium 228	0.294		0.2842		0.0902		0.0483	pCi/g	0.05	1
Thorium-232	0.171		0.3435		0.142		0.0302	pCi/g	0.45	1
Thorium-234	0.471		-0.05259	U	0.769		0.633	pCi/g	0.39	1
Uranium-235	0.194	U	0.1677	U	0.301		0.307	pCi/g	0.05	1
Uranium-238	0.471		-0.05259	U	0.769		0.633	pCi/g	0.39	1

Lab Sample ID: MB 160-490932/1-A

Client Sample ID: Method Blank

Matrix: Solid

Analysis Batch: 493019

Prep Type: Total/NA

Prep Batch: 490932

Analyte	MB	MB	Count	Total		Prepared	Analyzed	Dil Fac		
	Result	Qualifier	Uncert. (2σ+/-)	Uncert. (2σ+/-)	LOQ	DLC	Unit			
Actinium 228	0.1066	U	0.0739	0.0747		0.116	pCi/g	12/04/20 14:01	12/25/20 08:14	1
Actinium-227	0.2114	U	0.369	0.370		0.252	pCi/g	12/04/20 14:01	12/25/20 08:14	1
Bismuth-212	-0.5716	U	0.701	0.704		0.748	pCi/g	12/04/20 14:01	12/25/20 08:14	1
Bismuth-214	0.1200		0.0849	0.0858		0.0937	pCi/g	12/04/20 14:01	12/25/20 08:14	1
Cesium-137	0.01945	U	0.0528	0.0528	0.0700	0.0284	pCi/g	12/04/20 14:01	12/25/20 08:14	1
Lead-210	-1.091	U	1.58	1.59		1.35	pCi/g	12/04/20 14:01	12/25/20 08:14	1
Lead-212	0.05856		0.0656	0.0660		0.0417	pCi/g	12/04/20 14:01	12/25/20 08:14	1
Lead-214	-0.004878	U	0.0790	0.0790		0.0648	pCi/g	12/04/20 14:01	12/25/20 08:14	1
Potassium-40	-0.3926	U	1.05	1.05		0.608	pCi/g	12/04/20 14:01	12/25/20 08:14	1
Protactinium-231	-0.7658	U	2.88	2.88		2.34	pCi/g	12/04/20 14:01	12/25/20 08:14	1
Protactinium-234	0.1086		0.163	0.164		0.0693	pCi/g	12/04/20 14:01	12/25/20 08:14	1
Radium-226	0.1200		0.0849	0.0858	0.200	0.0937	pCi/g	12/04/20 14:01	12/25/20 08:14	1
Radium-228	0.1066	U	0.0739	0.0747		0.116	pCi/g	12/04/20 14:01	12/25/20 08:14	1
Thallium-208	0.006909	U	0.0135	0.0135		0.0442	pCi/g	12/04/20 14:01	12/25/20 08:14	1
Thorium 228	0.05856		0.0656	0.0660		0.0417	pCi/g	12/04/20 14:01	12/25/20 08:14	1
Thorium-232	0.1066	U	0.0739	0.0747		0.116	pCi/g	12/04/20 14:01	12/25/20 08:14	1
Thorium-234	-0.7448	U	0.597	0.603		0.681	pCi/g	12/04/20 14:01	12/25/20 08:14	1
Uranium-235	0.07022	U	0.183	0.183		0.144	pCi/g	12/04/20 14:01	12/25/20 08:14	1
Uranium-238	-0.7448	U	0.597	0.603		0.681	pCi/g	12/04/20 14:01	12/25/20 08:14	1

Lab Sample ID: LCS 160-490932/2-A

Client Sample ID: Lab Control Sample

Matrix: Solid

Analysis Batch: 493020

Prep Type: Total/NA

Prep Batch: 490932

Analyte	Spike	LCS	LCS	Total		%Rec.	Limits		
	Added	Result	Qual	Uncert. (2σ+/-)	LOQ	DLC	Unit	%Rec	
Americium-241	96.4	96.82		10.2		0.624	pCi/g	100	87 - 116
Cesium-137	26.7	26.82		2.90	0.0700	0.119	pCi/g	100	87 - 120
Cobalt-60	9.43	9.590		1.04		0.0186	pCi/g	102	87 - 115

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# QC Association Summary

Page 53 of 72

Client: Aptim Federal Services LLC  
Project/Site: HPNS-Parcel G 501197

Job ID: 160-40596-1  
SDG: GJ46599740

**Rad**

**Leach Batch: 490616**

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-40596-1	HPPG-ESU-TU107B-001	Total/NA	Solid	Dry and Grind	
160-40596-2	HPPG-ESU-TU107B-002	Total/NA	Solid	Dry and Grind	
160-40596-3	HPPG-ESU-TU107B-003	Total/NA	Solid	Dry and Grind	

**Leach Batch: 490623**

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-40596-4	HPPG-ESU-TU107B-004	Total/NA	Solid	Dry and Grind	
160-40596-5	HPPG-ESU-TU107B-005	Total/NA	Solid	Dry and Grind	
160-40596-6	HPPG-ESU-TU107B-006	Total/NA	Solid	Dry and Grind	
160-40596-7	HPPG-ESU-TU107B-007	Total/NA	Solid	Dry and Grind	
160-40596-8	HPPG-ESU-TU107B-008	Total/NA	Solid	Dry and Grind	
160-40596-9	HPPG-ESU-TU107B-009	Total/NA	Solid	Dry and Grind	
160-40596-10	HPPG-ESU-TU107B-010	Total/NA	Solid	Dry and Grind	
160-40596-11	HPPG-ESU-TU107B-011	Total/NA	Solid	Dry and Grind	
160-40596-12	HPPG-ESU-TU107B-012	Total/NA	Solid	Dry and Grind	
160-40596-13	HPPG-ESU-TU107B-013	Total/NA	Solid	Dry and Grind	
160-40596-14	HPPG-ESU-TU107B-014	Total/NA	Solid	Dry and Grind	
160-40596-15	HPPG-ESU-TU107B-015	Total/NA	Solid	Dry and Grind	
160-40596-16	HPPG-ESU-TU107B-016	Total/NA	Solid	Dry and Grind	
160-40596-17	HPPG-ESU-TU107B-017	Total/NA	Solid	Dry and Grind	
160-40596-18	HPPG-ESU-TU107B-018	Total/NA	Solid	Dry and Grind	
160-40596-19	HPPG-ESU-TU107B-019	Total/NA	Solid	Dry and Grind	
160-40596-20	HPPG-ESU-TU107B-020	Total/NA	Solid	Dry and Grind	
160-40596-21	HPPG-ESU-TU107B-021	Total/NA	Solid	Dry and Grind	
160-40596-22	HPPG-ESU-TU107B-022	Total/NA	Solid	Dry and Grind	
160-40596-23	HPPG-ESU-TU107B-023	Total/NA	Solid	Dry and Grind	
160-40596-24	HPPG-ESU-TU107B-024	Total/NA	Solid	Dry and Grind	
160-40596-25	HPPG-ESU-TU107B-025	Total/NA	Solid	Dry and Grind	
160-40596-26	HPPG-F-049	Total/NA	Solid	Dry and Grind	
160-40596-27	HPPG-F-050	Total/NA	Solid	Dry and Grind	
160-40596-18 DU	HPPG-ESU-TU107B-018	Total/NA	Solid	Dry and Grind	

**Prep Batch: 490832**

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-40596-1	HPPG-ESU-TU107B-001	Total/NA	Solid	Fill_Geo-21	490616
160-40596-2	HPPG-ESU-TU107B-002	Total/NA	Solid	Fill_Geo-21	490616
160-40596-3	HPPG-ESU-TU107B-003	Total/NA	Solid	Fill_Geo-21	490616
160-40596-4	HPPG-ESU-TU107B-004	Total/NA	Solid	Fill_Geo-21	490623
160-40596-5	HPPG-ESU-TU107B-005	Total/NA	Solid	Fill_Geo-21	490623
160-40596-6	HPPG-ESU-TU107B-006	Total/NA	Solid	Fill_Geo-21	490623
160-40596-7	HPPG-ESU-TU107B-007	Total/NA	Solid	Fill_Geo-21	490623
160-40596-8	HPPG-ESU-TU107B-008	Total/NA	Solid	Fill_Geo-21	490623
160-40596-9	HPPG-ESU-TU107B-009	Total/NA	Solid	Fill_Geo-21	490623
160-40596-10	HPPG-ESU-TU107B-010	Total/NA	Solid	Fill_Geo-21	490623
160-40596-11	HPPG-ESU-TU107B-011	Total/NA	Solid	Fill_Geo-21	490623
160-40596-12	HPPG-ESU-TU107B-012	Total/NA	Solid	Fill_Geo-21	490623
160-40596-13	HPPG-ESU-TU107B-013	Total/NA	Solid	Fill_Geo-21	490623
160-40596-14	HPPG-ESU-TU107B-014	Total/NA	Solid	Fill_Geo-21	490623
160-40596-15	HPPG-ESU-TU107B-015	Total/NA	Solid	Fill_Geo-21	490623
160-40596-16	HPPG-ESU-TU107B-016	Total/NA	Solid	Fill_Geo-21	490623
160-40596-17	HPPG-ESU-TU107B-017	Total/NA	Solid	Fill_Geo-21	490623

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# QC Association Summary

Page 54 of 72

Client: Aptim Federal Services LLC  
Project/Site: HPNS-Parcel G 501197

Job ID: 160-40596-1  
SDG: GJ46599740

## Rad (Continued)

### Prep Batch: 490832 (Continued)

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-40596-18	HPPG-ESU-TU107B-018	Total/NA	Solid	Fill_Geo-21	490623
MB 160-490832/1-A	Method Blank	Total/NA	Solid	Fill_Geo-21	
LCS 160-490832/2-A	Lab Control Sample	Total/NA	Solid	Fill_Geo-21	
160-40596-18 DU	HPPG-ESU-TU107B-018	Total/NA	Solid	Fill_Geo-21	490623

### Prep Batch: 490932

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-40596-19	HPPG-ESU-TU107B-019	Total/NA	Solid	Fill_Geo-21	490623
160-40596-20	HPPG-ESU-TU107B-020	Total/NA	Solid	Fill_Geo-21	490623
160-40596-21	HPPG-ESU-TU107B-021	Total/NA	Solid	Fill_Geo-21	490623
160-40596-22	HPPG-ESU-TU107B-022	Total/NA	Solid	Fill_Geo-21	490623
160-40596-23	HPPG-ESU-TU107B-023	Total/NA	Solid	Fill_Geo-21	490623
160-40596-24	HPPG-ESU-TU107B-024	Total/NA	Solid	Fill_Geo-21	490623
160-40596-25	HPPG-ESU-TU107B-025	Total/NA	Solid	Fill_Geo-21	490623
160-40596-26	HPPG-F-049	Total/NA	Solid	Fill_Geo-21	490623
160-40596-27	HPPG-F-050	Total/NA	Solid	Fill_Geo-21	490623
MB 160-490932/1-A	Method Blank	Total/NA	Solid	Fill_Geo-21	
LCS 160-490932/2-A	Lab Control Sample	Total/NA	Solid	Fill_Geo-21	

### Prep Batch: 491323

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-40596-1	HPPG-ESU-TU107B-001	Total/NA	Solid	DPS-7	490616
160-40596-11	HPPG-ESU-TU107B-011	Total/NA	Solid	DPS-7	490623
160-40596-21	HPPG-ESU-TU107B-021	Total/NA	Solid	DPS-7	490623
MB 160-491323/23-A	Method Blank	Total/NA	Solid	DPS-7	
LCS 160-491323/1-A	Lab Control Sample	Total/NA	Solid	DPS-7	

### Prep Batch: 491944

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-40596-1	HPPG-ESU-TU107B-001	Total/NA	Solid	ExtChrom	490616
160-40596-11	HPPG-ESU-TU107B-011	Total/NA	Solid	ExtChrom	490623
160-40596-21	HPPG-ESU-TU107B-021	Total/NA	Solid	ExtChrom	490623
MB 160-491944/1-A	Method Blank	Total/NA	Solid	ExtChrom	
LCS 160-491944/2-A	Lab Control Sample	Total/NA	Solid	ExtChrom	

# Tracer/Carrier Summary

Client: Aptim Federal Services LLC  
Project/Site: HPNS-Parcel G 501197

Page 55 of 72

Job ID: 160-40596-1  
SDG: GJ46599740

## Method: 905 - Strontium-90 (GFPC)

Matrix: Solid

Prep Type: Total/NA

Lab Sample ID	Client Sample ID	Percent Yield (Acceptance Limits)	
		Sr (40-110)	Y (40-110)
160-40596-1	HPPG-ESU-TU107B-001	97.1	96.8
160-40596-11	HPPG-ESU-TU107B-011	97.1	95.7
160-40596-21	HPPG-ESU-TU107B-021	96.7	91.2
LCS 160-491323/1-A	Lab Control Sample	100	99.8
MB 160-491323/23-A	Method Blank	100	92.7

**Tracer/Carrier Legend**

Sr = Sr Carrier  
Y = Y Carrier

## Method: A-01-R - Isotopic Thorium (Alpha Spectrometry)

Matrix: Solid

Prep Type: Total/NA

Lab Sample ID	Client Sample ID	Percent Yield (Acceptance Limits)	
		Th-229 (30-110)	
160-40596-1	HPPG-ESU-TU107B-001	70.1	
160-40596-11	HPPG-ESU-TU107B-011	78.8	
160-40596-21	HPPG-ESU-TU107B-021	80.6	
LCS 160-491944/2-A	Lab Control Sample	89.9	
MB 160-491944/1-A	Method Blank	93.0	

**Tracer/Carrier Legend**

Th-229 = Thorium-229

Eurofins TestAmerica, St. Louis



## Environment Testing America

### ANALYTICAL REPORT

Eurofins TestAmerica, St. Louis  
13715 Rider Trail North  
Earth City, MO 63045  
Tel: (314)298-8566

Laboratory Job ID: 160-40598-1  
Laboratory Sample Delivery Group: D1189454  
Client Project/Site: HPNS-Parcel G 501197  
Revision: 2

For:  
Aptim Federal Services LLC  
4005 Port Chicago Hwy, Suite 200  
Concord, California 94520

Attn: Rose Condit

*Rhonda Ridenhower*

---

Authorized for release by:  
4/14/2021 3:02:56 PM

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*Results relate only to the items tested and the sample(s) as received by the laboratory.*

# Table of Contents

Cover Page . . . . .	1
Table of Contents . . . . .	2
Case Narrative . . . . .	3
Chain of Custody . . . . .	6
Receipt Checklists . . . . .	8
Definitions/Glossary . . . . .	9
Method Summary . . . . .	10
Sample Summary . . . . .	11
Client Sample Results . . . . .	12
QC Sample Results . . . . .	13
QC Association Summary . . . . .	16
Tracer Carrier Summary . . . . .	17

# Case Narrative

Client: Aptim Federal Services LLC  
Project/Site: HPNS-Parcel G 501197

Page 58 of 72

Job ID: 160-40598-1  
SDG: D1189454

**Job ID: 160-40598-1**

**Laboratory: Eurofins TestAmerica, St. Louis**

**Narrative**

## CASE NARRATIVE

**Client: Aptim Federal Services LLC**

**Project: HPNS-Parcel G 501197**

**Report Number: 160-40598-1**

With the exceptions noted as flags or footnotes, standard analytical protocols were followed in the analysis of the samples and no problems were encountered or anomalies observed. In addition all laboratory quality control samples were within established control limits, with any exceptions noted below. Each sample was analyzed to achieve the lowest possible reporting limit within the constraints of the method. In some cases, due to interference or analytes present at high concentrations, samples were diluted. For diluted samples, the reporting limits are adjusted relative to the dilution required.

Eurofins TestAmerica, St. Louis attests to the validity of the laboratory data generated by Eurofins TestAmerica facilities reported herein. All analyses performed by Eurofins TestAmerica facilities were done using established laboratory SOPs that incorporate QA/QC procedures described in the application methods. Eurofins TestAmerica's operations groups have reviewed the data for compliance with the laboratory QA/QC plan, and data have been found to be compliant with laboratory protocols unless otherwise noted below.

The test results in this report meet all NELAP requirements for parameters for which accreditation is required or available. Any exceptions to NELAP requirements are noted in this report. Pursuant to NELAP, this report may not be reproduced, except in full, without the written approval of the laboratory.

Calculations are performed before rounding to avoid round-off errors in calculated results.

All holding times were met and proper preservation noted for the methods performed on these samples, unless otherwise detailed in the individual sections below.

All solid sample results for Chemistry analyses are reported on an ""as received"" basis unless otherwise indicated by the presence of a % solids value in the method header. All soil/sediment sample results for radiochemistry analyses are based upon sample as dried and disaggregated with the exception of tritium, carbon-14, and iodine-129 by gamma spectroscopy unless requested as wet weight by the client."

Any minimum detectable concentration (MDC), critical value (DLC), or Safe Drinking Water Act detection limit (SDWA DL) is sample-specific unless otherwise stated elsewhere in this narrative.

Reference the chain of custody and condition upon receipt report for any variations on receipt conditions and temperature of samples on receipt.

Manual Integrations were performed only when necessary and are in compliance with the laboratory's standard operating procedure. Detailed information can be found in the raw data section of the level IV report.

Radiochemistry sample results are reported with the count date/time applied as the Activity Reference Date.

The matrix for the Method Blank and LCS is as close to the following samples as can be reasonably achieved. Detailed information can be found in the most current revision of the associated SOP.

This laboratory report is confidential and is intended for the sole use of Eurofins TestAmerica and its client.

Revision 1- Updated isotopic thorium to report DLC.

Revision 2- Additional information requested in case narrative for total strontium

# Case Narrative

Page 59 of 72

Client: Aptim Federal Services LLC  
Project/Site: HPNS-Parcel G 501197

Job ID: 160-40598-1  
SDG: D1189454

## Job ID: 160-40598-1 (Continued)

### Laboratory: Eurofins TestAmerica, St. Louis (Continued)

#### RECEIPT

The samples were received on 11/27/2020; the samples arrived in good condition, properly preserved. The temperature of the coolers at receipt was 15.6 C.

#### STRONTIUM-90 (GFPC)

Sample HPPG-ESU-TU107B-B-001 (160-40598-1) was analyzed for Strontium-90 (GFPC) in accordance with EPA 905. The samples were dried on 12/02/2020, prepared on 12/09/2020 and analyzed on 12/18/2020.

When taking small mass aliquots from dried/disaggregated sample, the laboratory avoids large rocks/pebbles (as well as sticks, etc) which may constitute a larger than representative portion of the aliquot. Smaller rocks may be included. This is consistent with QSM and Laboratory SOP: HPPG-ESU-TU107B-B-001 (160-40598-1).

The method blank (MB) z-score is within limits and is stored in the level IV raw data. (MB 160-491323/23-A)

No analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

#### ISOTOPIC THORIUM (ALPHA SPECTROMETRY)

Sample HPPG-ESU-TU107B-B-001 (160-40598-1) was analyzed for Isotopic Thorium (Alpha Spectrometry) in accordance with DOE A01R\_Th. The samples were dried on 12/02/2020, prepared on 12/15/2020 and analyzed on 12/30/2020.

Isotopic Thorium Prep Batch 160-491944

A blank population correction was applied to account for contributions to the analyte count rate from sources other than the sample itself. Interferences may include, but are not limited to, impurities in reagents, tracers, or glassware, or effects due to the measurement process (such as tailing or crosstalk).HPPG-ESU-TU107B-B-001 (160-40598-1), (LCS 160-491944/2-A), (MB 160-491944/1-A), (160-40595-A-1-D) and (160-40595-A-1-E DU)

Results for the method blank (MB) are negative more than 3 times the 1 total propagated uncertainty (TPU). This appears to be random in nature, and does not affect the sample results. The magnitude of the negative results is minimal compared to the client sample results. The laboratory does not believe this excursion adversely affects the data.(MB 160-491944/1-A)

No analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

#### RADIUM-226 BY GAMMA SPEC (21 DAY INGROWTH)

Sample HPPG-ESU-TU107B-B-001 (160-40598-1) was analyzed for Radium-226 by gamma spec (21 day ingrowth) in accordance with EPA GA\_01\_R. The samples were dried on 12/02/2020, prepared on 12/04/2020 and analyzed on 12/25/2020.

Gamma prep batch 160-490932

The method blank (MB) z-score associated with Prep Batch 160-490932 is within limits and is stored in the level IV raw data. (MB 160-490932/1-A)

Many isotopes requested for analysis do not have any gamma emissions, or the gamma emissions they do have are very poor. Often, such analytes are reported by gamma spectrometry assuming secular equilibrium with a longer-lived parent. The client should ensure that such inference is acceptable for their sample based upon process knowledge. The following assumptions were made for this report:

Inferred from      Reported to Analyte

Th-234	Pa-234
Th-234	U-238
Pb-210	Po-210
Pb-210	Bi-210
Cs-137	Ba-137m
Pb-212	Po-216
Xe-131m	Xe-131
Sb-125	Te-125m
Ag-108m	Ag-108

## Case Narrative

Page 60 of 72

Client: Aptim Federal Services LLC  
Project/Site: HPNS-Parcel G 501197

Job ID: 160-40598-1  
SDG: D1189454

### Job ID: 160-40598-1 (Continued)

#### Laboratory: Eurofins TestAmerica, St. Louis (Continued)

Rh-106	Ru-106
Pb-212	Th-228
Pb-212	Ra-224
U-235	Th-231
Ac-228	Th-232
Ac-228	Ra-228
Th-227	Ra-223
Th-227	Ac-227
Th-227	Bi-211
Th-227	Pb-211
Bi-214	Ra-226

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.



# CHAIN OF CUSTODY

Ref. Document # 501197RSY-048

Page 1 of 2

APTIM Federal Services, LLC

4005 Port Chicago Hwy  
Concord, CA 94520Project Manager: Lisa Berck  
Phone #: (619)213-3389Send Report to: Rose Condit  
Phone/Fax Number: 415-987-0760  
Address: 4005 Port Chicago Hwy

Sample Lead: Murri, Andrew

Sample Tech(s):

Page 6 of 17

				Project Number: 501197		Analysis Requested										
				Project Name: Hunters Point Naval Shipyard: Parcel G Remedial Action												
				Project Location: San Francisco, CA												
				Purchase Order #: 1159058												
				Shipment/Pickup Date: 11/25/2020												
				Waybill Number: 495702256192												
				Lab Destination: Test America (St. Louis Lab) 13715 Rider Trail North Earth City, MO 63046												
Lab Contact Name/ph #				Gamma Spec (EPA 9011; M) - Full 21 day in growth gamma						Isotope Th(228, 230, 232)		Dose Rate uR/Hr	Evidence Bag ID	Comment		
				Standard-80 (EPA 9015 MDD)												
				Matrix	# of Containers	Preservatives (water)										
						Preservatives (soil)										
Collection Information						Container Type										
Sample ID	Date	Time	Method	SO	1	16 oz. plastic jar						X	X	X	5	D1189454

Special Instructions:

21 day ingrowth results only

Turnaround Time: 3-day  10-Day  28-day  Other  Level of QC Required: I II III Project Specific

Method Codes C = Composite G = Grab Matrix Codes: DW = Drinking Water; So = Soil; GW = Ground Water; SL = Sludge; WW = Waste Water; CP = Chip Samples; A = Air; ABS = Asbestos; PO = Pipe Opening

Relinquished By:	Relinquisher Signature:	Relinquish Date Time:	Received By:	Received Signature:	Receive Date Time:
Murri, Andrew		11/25/2020 11:59	Devin Lewis		11/25/2020 11:59
Devin Lewis		11/25/2020 12:00	SHIPPEDTOLAB		11/27/2020 09:12

\*\*\* Last 3 transfers shown above - Complete list of transfers on last page \*\*\*

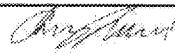
MICHA KORRINHTZER



160-40598 Chain of Custody



## All Transfers for COC 501197RSY-048

Relinquished By:	Relinquisher Signature:	Relinquish Date Time:	Received By:	Received Signature:	Receive Date Time:
Murri, Andrew		11/25/2020 11:59	Devin Lewis		11/25/2020 11:59
Devin Lewis		11/25/2020 12:00	SHIPPEDTOLAB	 MICHA KORRINHAUSER	11/25/2020 12:00

## Login Sample Receipt Checklist

Client: Aptim Federal Services LLC

Job Number: 160-40598-1  
SDG Number: D1189454**Login Number:** 40598**List Source:** Eurofins TestAmerica, St. Louis**List Number:** 1**Creator:** Greer, Diane A

Question	Answer	Comment
Radioactivity wasn't checked or is </= background as measured by a survey meter.	True	
The cooler's custody seal, if present, is intact.	True	
Sample custody seals, if present, are intact.	True	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	N/A	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	True	
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time (excluding tests with immediate HTs)	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	True	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	True	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

# Definitions/Glossary

Page 64 of 72

Client: Aptim Federal Services LLC  
Project/Site: HPNS-Parcel G 501197

Job ID: 160-40598-1  
SDG: D1189454

## Qualifiers

Rad Qualifier	Qualifier Description
U	Undetected at the Limit of Detection.

## Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
%	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CFL	Contains Free Liquid
CFU	Colony Forming Unit
CNF	Contains No Free Liquid
DER	Duplicate Error Ratio (normalized absolute difference)
Dil Fac	Dilution Factor
DL	Detection Limit (DoD/DOE)
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision Level Concentration (Radiochemistry)
EDL	Estimated Detection Limit (Dioxin)
LOD	Limit of Detection (DoD/DOE)
LOQ	Limit of Quantitation (DoD/DOE)
MCL	EPA recommended "Maximum Contaminant Level"
MDA	Minimum Detectable Activity (Radiochemistry)
MDC	Minimum Detectable Concentration (Radiochemistry)
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
MPN	Most Probable Number
MQL	Method Quantitation Limit
NC	Not Calculated
ND	Not Detected at the reporting limit (or MDL or EDL if shown)
NEG	Negative / Absent
POS	Positive / Present
PQL	Practical Quantitation Limit
PRES	Presumptive
QC	Quality Control
RER	Relative Error Ratio (Radiochemistry)
RL	Reporting Limit or Requested Limit (Radiochemistry)
RPD	Relative Percent Difference, a measure of the relative difference between two points
TEF	Toxicity Equivalent Factor (Dioxin)
TEQ	Toxicity Equivalent Quotient (Dioxin)
TNTC	Too Numerous To Count

## Method Summary

Client: Aptim Federal Services LLC  
Project/Site: HPNS-Parcel G 501197

Page 65 of 72

Job ID: 160-40598-1  
SDG: D1189454

Method	Method Description	Protocol	Laboratory
905	Strontium-90 (GFPC)	EPA	TAL SL
A-01-R	Isotopic Thorium (Alpha Spectrometry)	DOE	TAL SL
GA-01-R	Radium-226 & Other Gamma Emitters (GS)	DOE	TAL SL
DPS-7	Preparation, Digestion/Precipitate Separation (7-Day In-Growth)	None	TAL SL
Dry and Grind	Preparation, Dry and Grind	None	TAL SL
ExtChrom	Preparation, Extraction Chromatography Resin Actinide Separation	None	TAL SL
Fill_Geo-21	Fill Geometry, 21-Day In-Growth	None	TAL SL

### Protocol References:

DOE = U.S. Department of Energy

EPA = US Environmental Protection Agency

None = None

### Laboratory References:

TAL SL = Eurofins TestAmerica, St. Louis, 13715 Rider Trail North, Earth City, MO 63045, TEL (314)298-8566

# Sample Summary

Client: Aptim Federal Services LLC  
Project/Site: HPNS-Parcel G 501197

Page 66 of 72

Job ID: 160-40598-1  
SDG: D1189454

Lab Sample ID	Client Sample ID	Matrix	Collected	Received	Asset ID
160-40598-1	HPPG-ESU-TU107B-B-001	Solid	11/25/20 10:56	11/27/20 09:12	

Eurofins TestAmerica, St. Louis

# Client Sample Results

Page 67 of 72

Client: Aptim Federal Services LLC  
Project/Site: HPNS-Parcel G 501197

Job ID: 160-40598-1  
SDG: D1189454

**Client Sample ID: HPPG-ESU-TU107B-B-001**

**Lab Sample ID: 160-40598-1**

Matrix: Solid

Date Collected: 11/25/20 10:56  
Date Received: 11/27/20 09:12

## Method: 905 - Strontium-90 (GFPC)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			Uncert. (2σ+/-)	Uncert. (2σ+/-)						
Strontium-90	-0.0106	U	0.142	0.142	0.331	0.117	pCi/g	12/09/20 18:42	12/18/20 20:16	1
<b>Carrier</b>	<b>%Yield</b>	<b>Qualifier</b>	<b>Limits</b>					<b>Prepared</b>	<b>Analyzed</b>	<b>Dil Fac</b>
Sr Carrier	98.7		40 - 110					12/09/20 18:42	12/18/20 20:16	1
Y Carrier	94.6		40 - 110					12/09/20 18:42	12/18/20 20:16	1

## Method: A-01-R - Isotopic Thorium (Alpha Spectrometry)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			Uncert. (2σ+/-)	Uncert. (2σ+/-)						
Thorium-228	0.293		0.0594	0.0643	0.250	0.0213	pCi/g	12/15/20 14:37	12/30/20 10:45	1
Thorium-230	0.243		0.0615	0.0648	0.250	0.0241	pCi/g	12/15/20 14:37	12/30/20 10:45	1
Thorium-232	0.325		0.0546	0.0611	0.250	0.00954	pCi/g	12/15/20 14:37	12/30/20 10:45	1
<b>Tracer</b>	<b>%Yield</b>	<b>Qualifier</b>	<b>Limits</b>					<b>Prepared</b>	<b>Analyzed</b>	<b>Dil Fac</b>
Thorium-229	80.8		30 - 110					12/15/20 14:37	12/30/20 10:45	1

## Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			Uncert. (2σ+/-)	Uncert. (2σ+/-)						
Actinium 228	0.233		0.160	0.162		0.106	pCi/g	12/04/20 14:01	12/25/20 09:51	1
Actinium-227	0.157	U	0.337	0.337		0.302	pCi/g	12/04/20 14:01	12/25/20 09:51	1
Bismuth-212	-0.350	U	0.888	0.889		0.700	pCi/g	12/04/20 14:01	12/25/20 09:51	1
<b>Bismuth-214</b>	<b>0.329</b>		0.139	0.144		0.0627	pCi/g	12/04/20 14:01	12/25/20 09:51	1
Cesium-137	-0.0251	U	0.0690	0.0691	0.0700	0.0545	pCi/g	12/04/20 14:01	12/25/20 09:51	1
Lead-210	1.42		1.37	1.39		0.917	pCi/g	12/04/20 14:01	12/25/20 09:51	1
Lead-212	0.347		0.0870	0.0961		0.0431	pCi/g	12/04/20 14:01	12/25/20 09:51	1
Lead-214	0.392		0.118	0.126		0.0433	pCi/g	12/04/20 14:01	12/25/20 09:51	1
Potassium-40	7.28		1.33	1.57		0.295	pCi/g	12/04/20 14:01	12/25/20 09:51	1
Protactinium-231	-0.933	U	3.11	3.11		2.53	pCi/g	12/04/20 14:01	12/25/20 09:51	1
Protactinium-234	0.00263	U	0.00476	0.00477		0.288	pCi/g	12/04/20 14:01	12/25/20 09:51	1
Radium-226	0.329		0.139	0.144	0.200	0.0627	pCi/g	12/04/20 14:01	12/25/20 09:51	1
Radium-228	0.233		0.160	0.162		0.106	pCi/g	12/04/20 14:01	12/25/20 09:51	1
Thallium-208	0.145		0.0586	0.0610		0.0231	pCi/g	12/04/20 14:01	12/25/20 09:51	1
Thorium 228	0.347		0.0870	0.0961		0.0431	pCi/g	12/04/20 14:01	12/25/20 09:51	1
<b>Thorium-232</b>	<b>0.233</b>		0.160	0.162		0.106	pCi/g	12/04/20 14:01	12/25/20 09:51	1
Thorium-234	-0.824	U	0.766	0.773		0.604	pCi/g	12/04/20 14:01	12/25/20 09:51	1
Uranium-235	0.184	U	0.489	0.489		0.532	pCi/g	12/04/20 14:01	12/25/20 09:51	1
Uranium-238	-0.824	U	0.766	0.773		0.604	pCi/g	12/04/20 14:01	12/25/20 09:51	1

Eurofins TestAmerica, St. Louis

# QC Sample Results

Client: Aptim Federal Services LLC  
Project/Site: HPNS-Parcel G 501197

Page 68 of 72

Job ID: 160-40598-1  
SDG: D1189454

## Method: 905 - Strontium-90 (GFPC)

Lab Sample ID: MB 160-491323/23-A

Matrix: Solid

Analysis Batch: 492430

Client Sample ID: Method Blank  
Prep Type: Total/NA  
Prep Batch: 491323

Analyte	MB		Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)		LOQ	DLC	Unit	Prepared		Dil Fac
	Result	MB Qualifier		(2σ+/-)	(2σ+/-)				Prepared	Analyzed	
Strontium-90	0.07392	U	0.140	0.140	0.331	0.331	0.108	pCi/g	12/09/20 18:42	12/18/20 20:20	1
<b>Carrier</b>											
Sr Carrier	100			40 - 110					12/09/20 18:42	12/18/20 20:20	1
Y Carrier	92.7			40 - 110					12/09/20 18:42	12/18/20 20:20	1

Lab Sample ID: LCS 160-491323/1-A

Matrix: Solid

Analysis Batch: 492430

Client Sample ID: Lab Control Sample  
Prep Type: Total/NA  
Prep Batch: 491323

Analyte	MB		Spike Added	LCS		Total Uncert. (2σ+/-)	LOQ	DLC	Unit	%Rec	%Rec. Limits
	Result	MB Qualifier		LCS Result	LCS Qual						
Strontium-90	7.76		7.76	5.897		0.638	0.331	0.109	pCi/g	76	75 - 125
<b>Carrier</b>											
Sr Carrier	100			40 - 110							
Y Carrier	99.8			40 - 110							

## Method: A-01-R - Isotopic Thorium (Alpha Spectrometry)

Lab Sample ID: MB 160-491944/1-A

Matrix: Solid

Analysis Batch: 493574

Client Sample ID: Method Blank  
Prep Type: Total/NA  
Prep Batch: 491944

Analyte	MB		Spike Added	LCS		Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
	Result	MB Qualifier		LCS Result	LCS Qual							
Thorium-228	-0.03528	U		0.0205		0.0207	0.250	0.0163	pCi/g	12/15/20 14:37	12/30/20 10:45	1
Thorium-230	-0.06446	U		0.0317		0.0321	0.250	0.0228	pCi/g	12/15/20 14:37	12/30/20 10:45	1
Thorium-232	-0.003259	U		0.00917		0.00917	0.250	0.00754	pCi/g	12/15/20 14:37	12/30/20 10:45	1
<b>Tracer</b>												
Thorium-229	93.0			30 - 110						12/15/20 14:37	12/30/20 10:45	1

Lab Sample ID: LCS 160-491944/2-A

Matrix: Solid

Analysis Batch: 493575

Client Sample ID: Lab Control Sample  
Prep Type: Total/NA  
Prep Batch: 491944

Analyte	MB		Spike Added	LCS		Total Uncert. (2σ+/-)	LOQ	DLC	Unit	%Rec	%Rec. Limits
	Result	MB Qualifier		LCS Result	LCS Qual						
Thorium-230	2.01		2.01	1.989		0.213	0.250	0.0233	pCi/g	99	81 - 118
<b>Tracer</b>											
Thorium-229	89.9			30 - 110							

Eurofins TestAmerica, St. Louis

# QC Sample Results

Page 69 of 72

 Client: Aptim Federal Services LLC  
 Project/Site: HPNS-Parcel G 501197

 Job ID: 160-40598-1  
 SDG: D1189454

## Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

**Lab Sample ID:** MB 160-490932/1-A

**Matrix:** Solid

**Analysis Batch:** 493019

**Client Sample ID:** Method Blank

**Prep Type:** Total/NA

**Prep Batch:** 490932

Analyte	MB	MB	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
	Result	Uncert.		(2σ+/-)	Uncert.						
Actinium 228	0.1066	U		0.0739	0.0747		0.116	pCi/g	12/04/20 14:01	12/25/20 08:14	1
Actinium-227	0.2114	U		0.369	0.370		0.252	pCi/g	12/04/20 14:01	12/25/20 08:14	1
Bismuth-212	-0.5716	U		0.701	0.704		0.748	pCi/g	12/04/20 14:01	12/25/20 08:14	1
Bismuth-214	0.1200			0.0849	0.0858		0.0937	pCi/g	12/04/20 14:01	12/25/20 08:14	1
Cesium-137	0.01945	U		0.0528	0.0528	0.0700	0.0284	pCi/g	12/04/20 14:01	12/25/20 08:14	1
Lead-210	-1.091	U		1.58	1.59		1.35	pCi/g	12/04/20 14:01	12/25/20 08:14	1
Lead-212	0.05856			0.0656	0.0660		0.0417	pCi/g	12/04/20 14:01	12/25/20 08:14	1
Lead-214	-0.004878	U		0.0790	0.0790		0.0648	pCi/g	12/04/20 14:01	12/25/20 08:14	1
Potassium-40	-0.3926	U		1.05	1.05		0.608	pCi/g	12/04/20 14:01	12/25/20 08:14	1
Protactinium-231	-0.7658	U		2.88	2.88		2.34	pCi/g	12/04/20 14:01	12/25/20 08:14	1
Protactinium-234	0.1086			0.163	0.164		0.0693	pCi/g	12/04/20 14:01	12/25/20 08:14	1
Radium-226	0.1200			0.0849	0.0858	0.200	0.0937	pCi/g	12/04/20 14:01	12/25/20 08:14	1
Radium-228	0.1066	U		0.0739	0.0747		0.116	pCi/g	12/04/20 14:01	12/25/20 08:14	1
Thallium-208	0.006909	U		0.0135	0.0135		0.0442	pCi/g	12/04/20 14:01	12/25/20 08:14	1
Thorium 228	0.05856			0.0656	0.0660		0.0417	pCi/g	12/04/20 14:01	12/25/20 08:14	1
Thorium-232	0.1066	U		0.0739	0.0747		0.116	pCi/g	12/04/20 14:01	12/25/20 08:14	1
Thorium-234	-0.7448	U		0.597	0.603		0.681	pCi/g	12/04/20 14:01	12/25/20 08:14	1
Uranium-235	0.07022	U		0.183	0.183		0.144	pCi/g	12/04/20 14:01	12/25/20 08:14	1
Uranium-238	-0.7448	U		0.597	0.603		0.681	pCi/g	12/04/20 14:01	12/25/20 08:14	1

**Lab Sample ID:** LCS 160-490932/2-A

**Matrix:** Solid

**Analysis Batch:** 493020

**Client Sample ID:** Lab Control Sample

**Prep Type:** Total/NA

**Prep Batch:** 490932

Analyte	Spike	LCS	LCS	Uncert.	(2σ+/-)	Total	LOQ	DLC	Unit	%Rec.	Limits
	Added	Result	Qual								
Americium-241	96.4	96.82		10.2		0.624	pCi/g	100	87 - 116		
Cesium-137	26.7	26.82		2.90	0.0700	0.119	pCi/g	100	87 - 120		
Cobalt-60	9.43	9.590		1.04		0.0186	pCi/g	102	87 - 115		

**Lab Sample ID:** 160-40598-1 DU

**Matrix:** Solid

**Analysis Batch:** 493023

**Client Sample ID:** HPPG-ESU-TU107B-B-001

**Prep Type:** Total/NA

**Prep Batch:** 490932

Analyte	Sample	Sample	DU	DU	Uncert.	(2σ+/-)	Total	LOQ	DLC	Unit	RER	Limit
	Result	Qual	Result	Qual								
Actinium 228	0.233		0.4714		0.162		0.0455	pCi/g		0.74	1	
Actinium-227	0.157	U	-0.04679	U	0.680		0.261	pCi/g		0.20	1	
Bismuth-212	-0.350	U	-0.02624	U	0.610		0.436	pCi/g		0.22	1	
Bismuth-214	0.329		0.2617		0.0898		0.0369	pCi/g		0.29	1	
Cesium-137	-0.0251	U	0.02801	U	0.0491	0.0700	0.0381	pCi/g		0.45	1	
Lead-210	1.42		-0.1530	U	0.923		0.751	pCi/g		0.68	1	
Lead-212	0.347		0.2554		0.0698		0.0319	pCi/g		0.55	1	
Lead-214	0.392		0.2673		0.0722		0.0294	pCi/g		0.63	1	
Potassium-40	7.28		6.730		1.22		0.228	pCi/g		0.20	1	
Protactinium-231	-0.933	U	-0.6318	U	1.96		1.59	pCi/g		0.06	1	
Protactinium-234	0.00263	U	0.007675	U	0.0130		0.176	pCi/g		0.28	1	
Radium-226	0.329		0.2617		0.0898	0.200	0.0369	pCi/g		0.29	1	

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# QC Sample Results

Page 70 of 72

Client: Aptim Federal Services LLC  
Project/Site: HPNS-Parcel G 501197

Job ID: 160-40598-1  
SDG: D1189454

## Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS) (Continued)

Lab Sample ID: 160-40598-1 DU

Client Sample ID: HPPG-ESU-TU107B-B-001

Matrix: Solid

Prep Type: Total/NA

Analysis Batch: 493023

Prep Batch: 490932

Analyte	Sample	Sample	DU	DU	Total	(2σ+/-)	LOQ	DLC	Unit	RER	Limit
	Result	Qual	Result	Qual	Uncert.						
Radium-228	0.233		0.4714		0.162			0.0455	pCi/g	0.74	1
Thallium-208	0.145		0.1016		0.0408			0.0161	pCi/g	0.43	1
Thorium 228	0.347		0.2554		0.0698			0.0319	pCi/g	0.55	1
Thorium-232	0.233		0.4714		0.162			0.0455	pCi/g	0.74	1
Thorium-234	-0.824	U	0.1947	U	0.735			0.600	pCi/g	0.68	1
Uranium-235	0.184	U	0.0000	U	0.136			0.320	pCi/g	0.29	1
Uranium-238	-0.824	U	0.1947	U	0.735			0.600	pCi/g	0.68	1

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# QC Association Summary

Page 71 of 72

Client: Aptim Federal Services LLC  
Project/Site: HPNS-Parcel G 501197

Job ID: 160-40598-1  
SDG: D1189454

Rad

Leach Batch: 490770

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-40598-1	HPPG-ESU-TU107B-B-001	Total/NA	Solid	Dry and Grind	
160-40598-1 DU	HPPG-ESU-TU107B-B-001	Total/NA	Solid	Dry and Grind	

Prep Batch: 490932

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-40598-1	HPPG-ESU-TU107B-B-001	Total/NA	Solid	Fill_Geo-21	
MB 160-490932/1-A	Method Blank	Total/NA	Solid	Fill_Geo-21	
LCS 160-490932/2-A	Lab Control Sample	Total/NA	Solid	Fill_Geo-21	
160-40598-1 DU	HPPG-ESU-TU107B-B-001	Total/NA	Solid	Fill_Geo-21	490770

Prep Batch: 491323

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-40598-1	HPPG-ESU-TU107B-B-001	Total/NA	Solid	DPS-7	
MB 160-491323/23-A	Method Blank	Total/NA	Solid	DPS-7	
LCS 160-491323/1-A	Lab Control Sample	Total/NA	Solid	DPS-7	490770

Prep Batch: 491944

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-40598-1	HPPG-ESU-TU107B-B-001	Total/NA	Solid	ExtChrom	
MB 160-491944/1-A	Method Blank	Total/NA	Solid	ExtChrom	
LCS 160-491944/2-A	Lab Control Sample	Total/NA	Solid	ExtChrom	490770

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# Tracer/Carrier Summary

Page 72 of 72

Client: Aptim Federal Services LLC  
Project/Site: HPNS-Parcel G 501197

Job ID: 160-40598-1  
SDG: D1189454

## Method: 905 - Strontium-90 (GFPC)

Matrix: Solid

Prep Type: Total/NA

Lab Sample ID	Client Sample ID	Percent Yield (Acceptance Limits)	
		Sr (40-110)	Y (40-110)
160-40598-1	HPPG-ESU-TU107B-B-001	98.7	94.6
LCS 160-491323/1-A	Lab Control Sample	100	99.8
MB 160-491323/23-A	Method Blank	100	92.7

**Tracer/Carrier Legend**

Sr = Sr Carrier  
Y = Y Carrier

## Method: A-01-R - Isotopic Thorium (Alpha Spectrometry)

Matrix: Solid

Prep Type: Total/NA

Lab Sample ID	Client Sample ID	Percent Yield (Acceptance Limits)	
		Th-229 (30-110)	
160-40598-1	HPPG-ESU-TU107B-B-001	80.8	
LCS 160-491944/2-A	Lab Control Sample	89.9	
MB 160-491944/1-A	Method Blank	93.0	

**Tracer/Carrier Legend**

Th-229 = Thorium-229

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